CARNIVOROUS PLANT NEWSLETTER

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Front cover: *Nepenthes pervillei* in habitat at Maké, Seychelle Islands. Photo by Siegfried Hartmeyer. See News & View page 5.

Rear Cover: Close up of pitchers on a spectacular cultivated plant of *Nepenthes lowii* grown by Cliff Dodd of Daytona Beach, Florida. Photo by Clyde Bramblett. Please see News & View page 4

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All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

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EDITORIAL

GRAY HERBARIUM

by Co-Editors
Joe A. Mazrimas & Don Schnell

With this issue of CPN, Leo Song bids us farewell in his capacity as co-editor in charge of composing, printing and distributing CPN. This is necessitated by increased pressure of professional duties, research projects and personal obligations. Leo will remain with us as Business Manager and he hopes to find time to write some articles for CPN.

When Leo joined us as co-editor after volume six, he was instrumental in transferring from xerocopied pages to a magazine format with glazed paper and color pictures. Leo found the best printer for the money while still keeping subscription rates reasonable. His goal was to use computer technology to set up pages (thereby bypassing typesetter errors) and scanners to quickly reduce typewritten material to disk. A future goal was to place all photos on disc as well which may happen under the new co-editor. Leo always had the best interests of CPN subscribers and fellow CP enthusiasts at heart.

So, on behalf of the co-editors and CPN subscribers, we thank Leo for a job well done and we look forward to those articles that you talked about.

In charge of composing, printing and distributing CPN will be Steve Baker of Conover, North Carolina. Steve is a strong enthusiast and has a deep computer background. His vision is to continue to produce a quality magazine, completed and distributed in a timely manner from his home. However, readers are reminded that the business address of CPN will remain the same in Fullerton. Any questions about subscriptions, or new or renewal subscriptions, orders for back issues, or complaints about missing or damaged issues should still be forwarded to ICPS in care of the Fullerton Arboretum. For editorial matters or sending in material to be considered for CPN, please send them to any of the co-editors.

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News & Views

Clyde Bramblett (18950 S.W. 136th St., Miami, Florida 33196-1942)

Hope all is well. Things here are slowly getting back together, I hope. Things are not going easy. So much lost that it is taking so long to do anything. The cabinet man was supposed to come yesterday, he called last night and said he would make it today. It's now 9:45 PM and he has not come by. The carpenters were coming today—no show, no call. The roofers were supposed to be here Monday—no sign of them yet (and no call). And so it goes. The house is getting back to some shape in spite of it all, however everything is scattered and piled everywhere until you can't find anything. Have a wood frame greenhouse built on the foundation where the Lord & Burnham was and the *Nepenthes* (that's left) are doing fine. I lost a lot of *Nepenthes* that died like they got too cold. John deKanel was here and said they had frozen. I asked how can that be at 70° F and he replied, "What do you think the wind chill factor of a 200 MPH breeze would be?" I never thought of that. The military camped on my front yard for two weeks (I have 5 acres you know). They fed 400 a day there. They also said that the military had tracked the storm and that it had sustained winds of 208 with 50 MPH higher gusts. That could account for the damage.

Fairchild Gardens had their Ramble as scheduled and it was well attended and even though our CP display was smaller this year it was well received. We put the usual *Nep., Sarracenia, Drosera* etc. display (100 sq. feet). Craig Johnson, Don Kelley, Manny Herrera and myself put it together and manned the booth.

Have a few pictures I will send. If you can use any of them I do have slides of them all. Cliff Dodd really does a good job with *Nepenthes* and *Heliamphora*. That *N. lowii* is fantastic.

Cliff Dodd with a fine plant of *Nepenthes lowii* grown by him in Daytona Beach. FL. Photo by Clyde Bramblett (Orgel's Orchids, 18950 SW 136th ST., Miami, FL 33196)

Manny Herrera stands by the ICPS sign and some plants Clyde Bramblett, he and several others got together for the Fairchild Tropical Garden annual "Ramble" on Dec 5 and 6, 1992. Photo by Clyde Bramblett (Orgel's Orchids, 18950 SW 136th ST., Miami, FL 33196)

John D. Degreef (6, rue Libotte; B-4020 Liege; Belgium)

CPN Vol. 18 n°2 is again excellent! I hope the ICPS will go on publishing such interesting issues.

Of course, I was glad to find my article on the Droseraceae during the Glaciations, although this was meant to be the fourth article of the series. Unfortunately one whole paragraph is totally garbled: the third last one on page 46 (starting with: "Thus the simplest karyotype...")! Maybe it would be a good idea to print an erratum in a future issue. The relation of *Drosera spathulata* with *D. oblanceolata* is not well known among amateurs, and the question of the origin of the former species is an important one.

I have just located an article describing a find of *Aldrovanda* seeds from the Cretaceous, so this genus is even older than usually thought. I am still trying to find a complete set of references to write a short article on prehistoric *Aldrovanda* specifically.

While looking at a *Drosera regia* plant, I recently noticed that this species has functional sessile glands. In most sundews these are vestigial and do not produce secretions. Together with the *Dionaea*-like pollen of *Drosera regia*, this seems to be an archaic character linking it with *Drosophyllum*. The origin of the latter's sessile digestive glands could thus be ordinary slime glands!

Pr. JOLIVET from Paris recently gave me some dried leaves of *Caltha dionaeifolia*, a species described in my article on the origins of *Cephalotus*. I have been able to ascertain the presence of stomata on the protected surfaces of the strange folded leaves exclusively. The leaves are tightly fitted together and form small cushions. This would confirm the need for protection from the wind and rainstorms, as hypothesized in my article. Also, this species' flower is very much like the one of *Cephalotus*!

Siegfried Hartmeyer (Wittlinger Str. 5, 7858 Weil am Rhein, Germany) Spezialist für fleischfressende Pflanzen writes: Enclosed you find my travel-report featuring an excursion to the Seychelles Islands to see the pitcher plant, *Nepenthes pervillei*. I hope you can use it for 'CPN' even though it's not on a DOS-Disc. Additionally, you will find

two photos showing *N. pervillei*. They were taken by myself and if you like them, 'CPN' can print them. The German version of the report and the photos are published also in the next 'Taublatt' of the German Carnivorous Plant Society ,'GFP'. Also available in European VHS and Super-VHS is a semi-professional video in the German language (56 minutes) showing the Seychelles trip and additional beautiful pictures of *Roridula* and their bugs, Australian tuberous droseras, a German swamp and activities of the 'GFP' and Suisse CP enthusiasts. The chance to win a video is given in a quiz asking for different CP's. I do not sell the video professionally, but for interested persons I will send it for a charge of DM 39, for a European VHS-System copy on normal quality tape, and DM 46, on High Quality Tape in European VHS or S-VHS-System. I always supply the postage. The travel-report was translated from German by the charming and very kind Mrs. Lois Glass in England. Her wonderful work makes it possible that in both languages, it is identical. Please do not return the photos, you can also use them as a postcard for a very good CP-friend.

Tom Kahl (1351 Lake Washington Blvd. S.; Seattle, WA 98144) writes: I received some plantlets of *P. antarctica* from Randy Lamb while he was in Chile on the Chiloé Is. Seeing the plant was natively from 44 degrees south latitude, I hoped it would do well here in the Pacific Northwest.

I treated the plant like any of the southeastern U.S. *Pinguicula* by planting it in a mix of peat/vermiculite/#8 sand in approximately equal proportions. I was told by Randy that in the wild it grew in straight peat moss. In the winter, it does not form a hibernaculum but it does get smaller and more compact. I haven't been successful with leaf cuttings yet but the seed that it produces tends to be fairly viable even after a year in storage. No stratification was used to germinate the seed.

On these particular plants I noticed that the flower never really opened but self-pollinated itself while closed. Also, the leaves tend to cleft later in the summer growing season.

Randy Lamb (Box 6112, Whitehorse, Yukon Canada Y1A 5L7l) writes:

The Pacific Northwest Carnivorous Plant Club undertook a double field trip weekend this past Earthday '92. Our international group was comprised of the

American contingent from Washington state [Tom Kahl, Andrew Marshall and Kevin Snively and the Canadian portion from the province of British Columbia [Lorne Dennison, Doug Fung, Lawrence Ho, Chris Nickle and his friend Jamie] and Yukon [yours truly].

Our Saturday field trip, April 25th, was a visit to our regional CP bog to check up on the CP planted there over the previous three years. Amongst the multitudes of indigenous *Drosera rotundifolia, Sphagnum* and pink flowered swamp laurel (*Kalmia polifolia*), we found several of our naturalized *Sarracenia purpurea* and S. *flava x purpurea* in bloom. The *S. flava* and Venus' fly traps were still growing after several winters but they were not thriving.

Several young *Darlingtonia, S. purpurea x leucophylla* and *D. capensis* were added to the bog along with seeds of *S. purpurea, Darlingtonia* and *D. capensis*. Specimens of *Utricularia gibba* and *U. inflata* were added to the prolific and indigenous *U. macrorhiza* in nearby pools.

The Sunday field trip, on April 26th, was a "quest for *Drosera x obovata*" along the shores of a local bog lake which is surrounded by floating mats of *Sphagnum* containing both *D. rotundifolia* and *D. anglica.* While only five people could make it for this second field trip of the weekend, the results were worth it. The *D. rotundifolia* were more than abundant everywhere and slowly the hybrid sundews were found along with their maternal parent *D. anglica.*

U. intermedia was also found along the precarious peat edges of the floating mats. Frequently, too-closely gathered individuals were sent scrambling for more stable ground as their combined weights exceeded the buoyancy of the areas containing the admired plants.

Despite the wet weather during the second field trip, and the nearly complete absence of dry footwear, spirits remained high. Club members learn to cope with wet weather when they go out "bogging" in the rainy Pacific Northwest.

Barry Meyers-Rice (Steward Observatory; University of Arizona; Tucson AZ 85721) came across an interesting illustrated article while going through some very old issues of Scientific American. The issue was December, 1909, p. 469. The author was Leonard Bastin who actually showed surprising knowledge of CP considering the year of publication. His premise was that over time CP might become gigantic and that in a sense the man-eating plant of Madagascar might actually come to pass.

He copiously illustrated his article with various photos (apparently) and pretty good drawings with various animals and hapless people entrapped in CP. One shows a ladder standing against the petiole of a *Cephalotus* pitcher rising somewhat above the ground and a man at the brim of the pitcher lending a hand to pull another careless naturalist out. I think that was my favorite. Another shows a woman and a man in separate (of course—it was 1909) traps of *Dionaea* waving their arms and screaming. Then, also is shown "A great bladderwort" is swallowing a reptile, and a large *Drosera* has captured several swans (swans?). Goats are trapped on leaves of butterworts. I think the author was quite serious.

All in all, lightly enjoyable—And just when you thought it was safe to go into the greenhouse again...

Matthew Robey (45 Wildemere Ave., Milford, CT. 06460).

I read with interest Jerry Stahle's article "The Seasonal Bog." (See CPN March/June 1992.) I have been growing CP in an outdoor bog of a different nature for four years. My method is more permanent in nature and less time consuming as well. I started out by digging a three foot by five foot rectangular hole to a depth of two feet. I lined the perimeter with 1/4 inch galvanized wire mesh which extended over the surface by approximately 4 inches. This proves to be a very effective method of keeping

out moles and other vermin. I then lined the hole with durable plastic, filled it in with 75% peat and 25% sand mixture, and enclosed the entire perimeter with old, discarded storm windows which were fastened together with metal L brackets. The result is a large bog, protected by the storm windows to a height of three feet above ground level. To keep birds and squirrels from digging up the peat and plants, I top it off with an old screen door. In Connecticut, the winter temperatures can get as low as minus 10 degrees F, and therefore I mulch it down in November each year starting with clear plastic sheeting covered with one foot of pine needles. In April, I remove the mulch, water it well, and place the screen door on top. I have been able to successfully grow, winter-over and produce seed of the following varieties: *Dionaea, D.. X nagamoto*, D. rotundifolia, D. capensis* (NL), *D. binata, D. filiformis, D. intermedia, Sarr. flava, Sarr. leucophylla, Sarr. minor, Sarr. purpurea,* and *Sarr. rubra.* Try the outdoor bog, you'll like how easy it is, how healthy the plants grow, and how much seed you end up with in the fall!

* *D.nagamoto* is sterile

Mike Ross (1730 Capitola Way, Fairfield CA 94533 ph 707-422-1993):

I attended the Chelsea Flower Show in London on May 25, 1991 and am happy to report that the British CP group had a formidable display that was receiving much public attention. Their group was selling seed and membership in the British Society. Their display received a gold medal and was most impressive. Their well stocked and flowering "bog" was approximately 8 x 12 feet with a small pool in the center. They used a newly available peat block system to contain and border the many levels of their display. Several other garden displays also emphasized the use of C.P.'s in their water garden scenes. There was even a hanging basket filled with numerous C.P. for the hanging basket competition. Marston Exotics also was in attendance and had an equally impressive display with numerous *Nepenthes.*

My military activation for the Desert Storm events also had me transiting the Frankfurt, Germany area. I managed a side trip to the Palmengarten and was most amazed at the special display of C.P. They had two 12 x 12 foot areas with overhead metal halide lamps. One display area had mostly North American species and a flowing stream. The other display had a more terrestrial look with plants from Africa to Australia. They also had two culture rooms that were closed to inspection but peering through the glass revealed a great depth to their collection. I was surprised to see they used clay pots almost exclusively in their culture room as well as embedded in their display "bogs".

I would highly recommend a visit to both of these areas if your future travel plans would allow.

Phil Sheridan (Rt. 2 Box 2120; Woodford, VA 22580)

How are things on the west coast? We have been pretty busy back east and have been enjoying the latest issues of CPN. I wish I could get back to those *Darlingtonia* bogs but school is keeping me pretty busy. I have some information which I would appreciate if you could put in News & Views.

The first thing concerns Mr Sikoryak's comments in News & Views of the September 1992 edition of CPN. I would have been delighted if he had given me a call instead of the Park Service. I could have given him a more detailed explanation of the introduced *Sarracenia alata* site in the Big Thicket of Texas. In any case here is some additional information which may help other readers.

In my article I state that *S. alata* grows in four natural community types within the West Gulf Coastal Plain; hillside, seepage bog, acid seep forest, wetland longleaf pine savanna and deep muck seepage bog. This region includes most of eastern Texas and adjacent western Louisiana [see Bridges and Orzell (1989), "Longleaf Pine

Communities of the West Gulf Coastal Plain'" published in the Natural Areas Journal, issue 9, #4]. Within the "Big Thicket Region" of southeastern Texas, however, *Sarracenia alata* naturally occurred only on seepage bogs which develop on the Willis and Bentley geologic formations. Outside of the Big Thicket *S. alata* does occur on other geologic formations (ex. Catahoula Formation in the Angelina National Forest of southeast Texas). The populations of S. *alata* on the Lance Rosier Unit and the Hickory Creek Savanna Unit of the Big Thicket National Preserve are not natural populations but were planted there as part of an experiment by a local botanist. To the casual visitor, their proliferation falsely renders them as a natural component of the wetland longleaf pine savanna on these units of the Big Thicket National Preserve. In sharp contrast the naturally occurring populations of *S. alata* which occur within the Village Creek Unit of the Big Thicket National Preserve are found in hillside seepage bogs on the Bentley Formation

In summary my point was that within the "Big Thicket Region" of southeastern Texas, *S. alata* did not historically (naturally) occur within the "Big Thicket Region" on the Bentley and Willis geologic formations in wetland longleaf pine savanna.

Some errors which I noticed from the publication process in this same article were on pg 103 where Rush County should be Rusk County. On page 104 a key word was deleted in the natural community discussed. Deep seepage bog should correctly read deep muck seepage bog. Finally page 107 *S. Ieucoplylla* should be *S. leucophylla*.

The Dec. 89, Vol. 18 article on "The Story of Tom Darling & Bear Lake" has a couple publication errors. Page 102 **Calla palustris** was incorrectly printed as **Calth palustris.** Also, **Chamaedaphne acalyculata** should be **Chamaedaphne calyculata.**

Rick Walker (2060 Oberlin St.,Palo Alto CA 94306)

Electronic CP Discussion Group Rick Walker has been managing a CP discussion group through electronic mail. Over 60 participants from Australia, to Finland, to the San Francisco Bay area are growing 300 different species of CP. Anyone that can send electronic mail to the UNIX Internet network is welcome to join the discussion. Drop Rick a note at **"walker@hpl-opus.hpl.hp.com"** for instructions on joining the group.

Dr. Louis Vogelpoel (7, Sunnybrae Rd., Rondebosch, Cape,South Africa)

I was most interested in your article on growing CP in "The Flow Table", since we have been growing *Disas* very successfully in long shallow tanks of circulating water for some five years. The results have been outstanding with the very beautiful but difficult terrestrial orchids from our cape mountains. After many years of trying to

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grow them on dry fibers we realized that they require bottom watering of very soft, acidic (pH 4.5-5.5) water that is very low in mineral salts like the streamside habitat. So we adapted the hydrocultural method and the results have been superior. In the tanks, I grow CP—*Drosera capensis, D. regia, Sarracenias* and *Nepenthes* as well as *Roridula gorgonias* which is not a true CP but does capture insects in the hairy glands. Beetles then suck the insects dry and their defacations supply the plant with nitrogen. All these plants grow in harmony with the *Disas* and other orchids. The CPs devour unwanted midge flies, thrips etc. so that I seldom need to use insecticides. I am rather keen to get more CP plants that enjoy bottom watering such as *Pinguiculas, Darlingtonia* and highland type *Nepenthes*. I have a very vigorous growing *Nepenthes* but need a female plant for breeding. It tolerated the winter well and has numerous pitchers on it. I grow sphagnum moss in this system. The moss is the first to show any stress of salt buildup. We empty the tanks (1,000 liters) every fortnight and replenish with clean water or use rain water collected in tanks. Whenever available, the *Disas* are fed with dilute macro-micro chemical mix in correct balance and the CPs are very happy.

SPECIAL ANNOUNCEMENT

Tom Johnson (P.O. Box 12281; Glendale CA 91224-0981) is now handling the ICPS Seed Bank. Please send SASE/2 IRC's for latest list. All orders and other inquiries should also be sent to him. He informs us that the Seed Bank is low on seeds, so please send in your excess seed.

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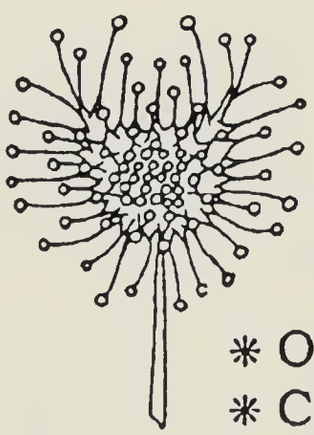

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Some Observations on the Trapping Mechanisms of *Nepenthes Inermis and N. Rhombicaulis*

By
Bruce Salmon
13 Rothery Rd., Manurewa, Auckland, NZ

Nepenthes inermis with its funnel shaped lower pitchers must surely be one of the most beautiful *Nepenthes*, but how does it manage to attract and capture its prey? It has virtually no peristome (in upper pitchers) and only a narrow lid which obviously cannot prevent it filling with water every time it rains. The contents of the pitchers point to three different trapping techniques.

1. Nectar feeders (flies,wasps) only seem to visit the under side of the lid. They drink so much nectar that they may become paralyzed and cannot move even if you touch them. It is then only a short drop into the wide bowl of liquid below. Viewed from above you can see that the lid positions the insect directly over the pitcher's mouth. Ants also visit the lid and sometimes the peristome but are seldom caught. It appears that the peristome is of little use in the upper pitchers.

2. Colour attracts insects such as mosquitoes and midges much as in the high school experiment using different coloured water filled saucers to find out which insects were attracted to which colours. The insects are captured when landing in the pitcher fluid.

3. Smell is possibly what attracts the earwigs and other nocturnal insects although I have not proven this yet.

Having postulated the secrets to its trapping success, one wonders how the pitcher manages to keep its prey from being washed out when it rains? The answer lies in the

N. inermis Upper Pitcher

Top view of pitcher. Note very narrow lid.

pitcher fluid itself. The fluid is thick and exceptionally viscous compared to most *Nepenthes*. You can pour some from a pitcher held several feet high and it will keep in an unbroken stream to the ground. Thus when it rains the pitcher sheds the excess water over its rim but its contents are secure. From these observations we can see how wonderfully adapted to a life of carnivory *N. inermis* really is.

N. rhombicaulis on the other hand has no upper pitchers only lowers. These lower pitchers occur from ground level to no more than 2 feet up the stem while the rest of the stem climbs high into the tree tops. The upper stem does not form pitchers on the ends of its tendrils and its only used for climbing.

N. rhombicaulis appears to be adapted to a life of catching ground dwelling insects but more specifically the subterranean ones. Pitchers found above ground are usually small (5cm) and have a thin peristome while those formed in dense moss or in very dark conditions grow larger (10cm) and have quite a large flared peristome, CPN 19(1&2):21. In habitat, the rosette leaves are fairly short and the tendrils are pushed into nearby mounds of moss. When the moss is pulled away a large pitcher is revealed. In cultivation, it seems that to grow the large pitchers the developing pitcher needs darkness and some kind of restriction before it can attain a large size (i.e. down the inside of the pot). It is also necessary that some of the plant be exposed to light as all plants need to photosynthesize to survive. This carnivorous adaptation reminds one of *N. ampullaria*. The contents of these subterranean pitchers were not examined but we will do so on our next visit to prove our theory.

Color Variation of *S. Purpurea* in a Northern Michigan Bog

By
Richard Shomin
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Flint, Michigan 48503 USA

While bogging in Michigan's Luce Co. in the summer of 1991, Gary Thieme and I came upon brightly colored plants of *S. purpurea* growing in full sunlight. The plants had a more yellowish appearance and lighter venation than what is typically observed. This made a pleasant display of yellowish and typical reddish plants throughout the bog. There was no success in finding a plant without red coloring. Some plants were blooming with yellow flowers (not in full bloom yet) but had fine red-veined leaves, this was certainly eye catching when growing next to the typically heavily veined *S. purpurea* .

A year later a more thorough investigation of the area was made. Unfortunately, late spring frosts had made it a poor flowering year and our hope to find *S. purpurea f. heterophylla* as a whole plant was diminished. About four plants from several locations were candidate plants of *S. purpurea f. heterophylla*, none of which were blooming. One plant I collected for close observation. Roughly half the plants in all locations were the typical red color while the other half were the yellowish-red plants.

One very interesting location had a highly contrasting color difference. Here *S. purpurea f. heterophylla* candidates were found and very deep red plants could be found even in the shade. Even if it turns out not to be a *S. purpurea f. heterophylla* location it is certainly an eye-catching sight.

Fred Case examined the plant I collected and said it looked liked S. *purpurea forma heterophylla* and that a flowering plant would be better for confirmation.
All plants in the photographs were growing in full sunlight.

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1. Schnell, D.E. 1978. Summary note: A Critical review of published variants of Sarr*acenia purpurea* L. CPN 7 :74-76.
2. Case, F.W. JR. 1956. Some Michigan records for *Sarracenia purpurea forma heterophylla*. Rhodora 58:203-207.
3. CPN 6:47.1977
4. CPN 6:33.1977

Nepenthes Growing Media

By
David E. Butler
127 Wright Road
Concord, Massachusetts 01742

The subject of growing media for *Nepenthes* has not been extensively explored. Frequently, writers cover the subject with a generalization. Such sources often contain general references to long fiber sphagnum. This observation, incidentally, is not entirely directed at others. For example, a prior note, CPN 16:83-87 (1987), surveyed some cultural variables for growing *Nepenthes* under lights, but made only a summary reference to long-fiber sphagnum as a growing medium. Certainly, long fiber is a good starting point for discussion, but there are some choices and alternatives. These choices become more important as the *Nepenthes* collection expands from the generally available, easily grown varieties, to rarer and more difficult species or hybrids.

True, many *Nepenthes* species and hybrids take well to long fiber sphagnum, as well as a variety of other growing media. However, sphagnum is not infallible. In particular, sphagnum can become waterlogged. This condition can lead to root rot. I have lost specimens of *N. reinwardtiana* and *albo-marginata* using this medium, apparently because of waterlogged root systems. Thus it is sometimes desirable to have a medium which provides greater aeration and drainage than pure sphagnum. Indeed, as one gets away from the more commonly grown species and hybrids, several species demand a medium which, for all practical purposes, is an epiphytic mix. This requirement suggests that some orchid media, either alone or mixed with sphagnum, have some relevance to growers of *Nepenthes*.

Interestingly, the orchid world has discovered that many orchids do well in sphagnum or sphagnum mixes. One of the larger suppliers of growing media and potting supplies to the orchid community is OFE International. Of course, if one is an orchid grower, there is sphagnum and then there is sphagnum. The hot item in the orchid world currently seems to be New Zealand sphagnum moss. OFE, in a recent catalog, offered NZ long fiber in 1/4 cubic foot bags, one and five kilo boxes, as well as NZ short fiber. Moss is shipped dry, and a one kilo box is pretty good size for a hobbyist. An article in the March, 1989 American Orchid Society Bulletin, titled "The New Sphagnum Moss from New Zealand", by Ann and Jim Mann, discusses the advantages of New Zealand moss. According to the Manns, NZ moss is a robust, resilient species, *Sphagnum cristatum*, which grows in the Pahiki swamps of New Zealand's south island, reaching a height of several inches. It is clean when harvested, according to the Manns, and also is picked over to remove leaves and debris. My experience is that NZ moss is indeed freer from leaves, sticks and grass than moss from domestic sources. I have no independent knowledge on this subject.

The Manns go on and assert that, because the moss is clean, and deemed to be free of soil, insects or fungi, they do not fear contacting sporotrichosis when handling it. This latter assertion has triggered some debate in the orchid literature. In the May, 1989 AOS Journal, Dr. Isadore Rudnikoff commented on the Mann article. She related that she had sent some NZ sphagnum to a hospital laboratory for analysis. Fungus culture yielded the presence of the mucoracea group, which Dr. Rudnikoff asserted is pathogenic to humans, citing as an example, mucormycosis (or Phycomycosis per Merck Manual 15th Ed.; editor's note). She called for an independent investigation.

The better view may be that no unsterilized organic matter is free of potential disease causing organisms. Perhaps the Manns confused absence of visible signs of soil, insects or fungi with the total absence of such factors. Consequently, one should take the same precautions when handling NZ moss as when handling other sphagnum. Again, I do not presume to know the "right" precautions, but parental common sense suggests that one keep the moss in a closed container, use it in a well ventilated area, not handle it when open wounds, such as cuts and scratches, are present on the hands. Individuals predisposed to infection obviously should carefully consider their options. Above all, say your prayers and brush your teeth regularly.

According to the Manns, the Japanese are the world's largest importers of NZ sphagnum. New Zealand's exports of this commodity have grown from under 10 metric tons in 1977 to 640 tons in 1987. Genera said to be grown using NZ moss include phalenopsis, cattleyas, oncidiums the beautiful south African terrestrials which have been photographed growing next to *Drosera capensis*. The Manns also mention the long lasting nature of the medium. Not surprisingly, they are also a commercial source for NZ moss.

OFE also has offered Canadian green long fibered sphagnum and Florida long fibered sphagnum, which I have no experience with. I generally use NZ moss. Although I do not agree with all the claims made for it, I have found it to be an excellent growing medium. However, in view of the potential health hazards which are not yet well-defined, I would not recommend it to others except at their own risk.

OFE and others also offer epiphytic mixes. OFE, for example, offers a phalenopsis mix consisting of NZ sphagnum, cork nuggets and charcoal. The mix alone dries out too quickly for my conditions, but when mixed with an equal amount of sphagnum, works very well. In particular, this mix avoids many of the root rot problems of straight sphagnum. Other epiphytic mixes appropriate for *Nepenthes* do not contain any sphagnum. For example, Slack, a leading authority on CP cultivation, has suggested either sphagnum or, as an alternative, a mix of peat, orchid bark and perlite. Kensington Orchids, another supplier of orchid potting media, offers a cattleya mix which contains similar ingredients, although apparently not in the same proportions recommended by Slack. Bill Scholl, an experienced *Nepenthes* grower, has reported that his plants do well in bark chips. He uses hardwood chips which are a side product of many industrial establishments. Pring (1943), a pioneer cultivator and hybridizer of *Nepenthes*, stated that he used three parts orchid peat to one part sphagnum moss Pring also wrote that he applied liquid cow manure to stimulate pitcher formation. In deference to other members of the household, the Pring fertilization method has not yet been applied to my collection.

Two varieties which now grow in a strictly epiphytic mix in my collection are *N. tenticulata* and *N. veitchii*. *N. veitchii*, a seedling, appears content in the Kensington cattleya mix with a top dressing of peat/sand and perlite. *N. tenticulata* is in the grower's mix, which appears to be hardwood chips or shavings. Approximately two dozen other *Nepenthes* variants are doing well in mixes of ordinary sphagnum, NZ sphagnum and/or OFE phalenopsis mix. These include *N. alata, boschiana, coccinea*,

khasiana, merilliana, reinwardtiana, trichocarpa, tobaica, truncata, ventricosa, and several *ventricosa* hybrids, as well as several recent additions. Plants which grow in straight sphagnum include *N. boissiense* (rubra), *infundibuliformis, mastersiana* and *superba*. I use sphagnum with these primarily because they tend to dry out more quickly, due to the size or vigor of the plants.

In addition, Bill Scholl has grown *N. ventricosa* in straight sand. The plants grown in this media are reportedly smaller in size than plants of comparable age in wood chips. This feature may in fact be desirable for growers with a space problem. Perhaps it would be useful for CPN readers to write in to discuss their growing media. If readers wish to write to me I will attempt to collate the answers for future use.

Suppliers which have recently advertised New Zealand sphagnum or bark mixes in the AOS Bulletin include the following:

OFE International, Inc,
P.O. Box 161302
Miami, Florida 33116

A & P Orchids
Peters Road
Swansea, Massachusetts 02777

Ann Mann's Orchids
9045 Ron-Den Lane
Windermere, Florida 32786-9238

Kensington Orchids
3301 Plyers Mill Road
Kensington, Maryland 20985
(has not offered sphagnum)

The above listing should not be viewed as an endorsement. I do not endorse any of these sources nor do I have any financial interest in them.

Authorities cited

Mann, A & J. The 'New' Sphagnum Moss From New Zealand. AOS Bull. 58:250 (March, 1989),

Pring, Nepenthes, XXXI Mo.Bot.G.Bull. 169, 172 (1943)

Rudnikoff. Letter to the Editor. AOS Bull. 58 :492 (May, 1989)

Slack, Insect Eating Plants and How to Grow Them 136 (1986)

NEW!

Floating Bogs for Tubs-Pools-Ponds. Several sizes and shapes. Custom sizes welcome. Send for free list.

Hobby Kit shown in picture.

Includes one basket one float and sphagnum moss. **$25.00** PP. (Foreign Add $5.00) One Alata Sarracenia $5.00 extra. Send To:

Glenn Tolman, Aquatic Nurseryman
2331 Goodloe • Houston, Texas 77093

Utricularia humboldtii Schomb IN FLOWER

By
Donald Schnell (Co-editor)

In late 1989, I was fortunate in being able to obtain living material of *Utricularia humboldtii*, the supposed "king of utricularia", with exotic origins in the Venezuelan tepui region, long leaves and huge flowers. There is little information in the literature on successful culture of this species (e. g. R.A.R., 1908). My source gave instructions on his successful vegetative growing of the plant, but his plants had never flowered. In nature, the plants grow in widely varied conditions. They can be found growing in peaty soils of areas of the Gran Sabana, as well as in moss and soils of the tops of tepui. The classical description is of the plants growing in the water filled basins of large bromeliads, particularly Brocchinia spp. other than our *B. reducta*. These bromels get to be 14 feet tall (R.A.R., 1908), and protruding from the tops are the two to three foot peduncles of *U. humboldtii* flowers. These bromel basins hold gallons of water and my attempts with smaller basin bromeliads easily accommodated in the home greenhouse (considerably less than 14 feet!) were rather unsuccessful.

I was able to grow the species in vegetative profusion in several circumstances. One was simply in pots of live sphagnum placed in trays of water; another was brown Canadian peat, also in pots in trays of water. My initial planting multiplied rapidly and I was able to give material to other growers who, however, only had mixed with vegetative growth, and no flowers for any of us.

The mysterious "R. A. R." (1908) alludes to growing the species successfully in "very large tub" with a leaf mold-peat mix. I do not know if this included flowering; it was not specifically mentioned. The only recent incidence of *U.humboldtii* flowering in culture to my knowledge is hearsay of a British grower (name not known to me) who got his plant to flower and carried it into Kew for interested people there to see.

I will refer the reader to Taylor (1989) for descriptive details. My leaves have easily reached the maximum 30 cm length as described. The leaf lamina in culture most often is spathulate in shape, rather than more varied shapes as pictured in Taylor, although these others are occasionally seen in my material. The blade is rather thick and succulent in character. The plant is one of several species in the genus that produces aerial shoots which implant into the nearest pot of something else and promptly take hold. Also, the plant grows so vigorously for me that stolons lead out of pot drainage holes and spread throughout the large water tray. The trays contain pots of other species, so I just let the *humboldtii* merrily grow, the sides of the other pots in the tray supporting the leaves in upright position.

I did not realize that by allowing my plants to run amuck, I had probably unwittingly created my own large bromeliad basins. In April, 1991, I was surveying this mass of vegetation and noting the usual maturing new leaves shooting up, long petioles finally expanding into blades at their tips. Then I noticed that some of the "stalks" looked different, these arising from plants in pots, and the free material out in trays. The stalk had a rather subtle slight widening in the middle, and the bud at the top was much smaller than a leaf. Magnification indeed indicated that these were likely flower buds on their peduncles.

I managed to contain my excitement since the flowers could very easily abort, but they grew on. The tip buds began to swell and then branch into pedicels with larger flat buds of utricularia flowers, only much larger. At last, in May 1991, flowers began opening.

Interestingly, the largest and finest inflorescences were from material "free" in the

water trays among pots of sarracenias and droseras. Some of the flowers of plants confined to pots did indeed abort, although some developed to a lesser extent. My peduncles were far shorter than the maximum 1.3 meter described in nature (Taylor, 1989), the tallest one before first pedicel branching being 31.5 cm, although not unimpressive! The peduncles were 2 mm. thick at the center and each had widely spaced minute scales. Flower numbers are described as 5-16 (Ibid.), and mine was up to three. The largest individual flower measured 5.2 cm across maximum, and all were the typically described mauve with yellow lines on the palate of the lower lip. The flowers had no fragrance and such has not been described.

By pulling down the lower lip a bit, I was able to easily expose the typical lentibulariad stamens and pistil, and easily effect self and cross pollinations without destroying the corolla.

The flowers lasted a good time, even after pollination, for up to ten days after which the corolla was promptly shed disclosing the ovaries swelling into seed capsules which were mature within four weeks in both the self and cross pollinated flowers. The capsules opened transversely while still green and began shedding 1.5 mm flattened peltate seeds, spilling over the lip like slow motion (days) theater popcorn machine. The capsules never opened widely.

Examining the seeds under magnification with back lighting disclosed that the testa was semi-translucent and one could just see minute comma-shaped green embryo within. Magnification also confirmed that these freshly shed seeds were still moist. This concurs with a conversation I had with Warren Stoutamire about 15-20 years ago who told of receiving dry seed from sources in Venezuela which did not germinate. From his examination of the dry seed, he surmised that they could only be viable when fresh and still moist—Once dry, they were essentially dead since they had little to no supporting endosperm.

I sowed fresh seed onto the surface of wet Canadian peat, and within a week, minute plants had germinated. These consisted of a radially growing branched spidery stolon less than 0.1 mm in thickness on the peat surface. A week later, small traps were also seen on the surface, and the stolons began growing down into the peat, still less than threadlike in caliber. Now (August, 1991) I have minute green leaves 2mm. tall!

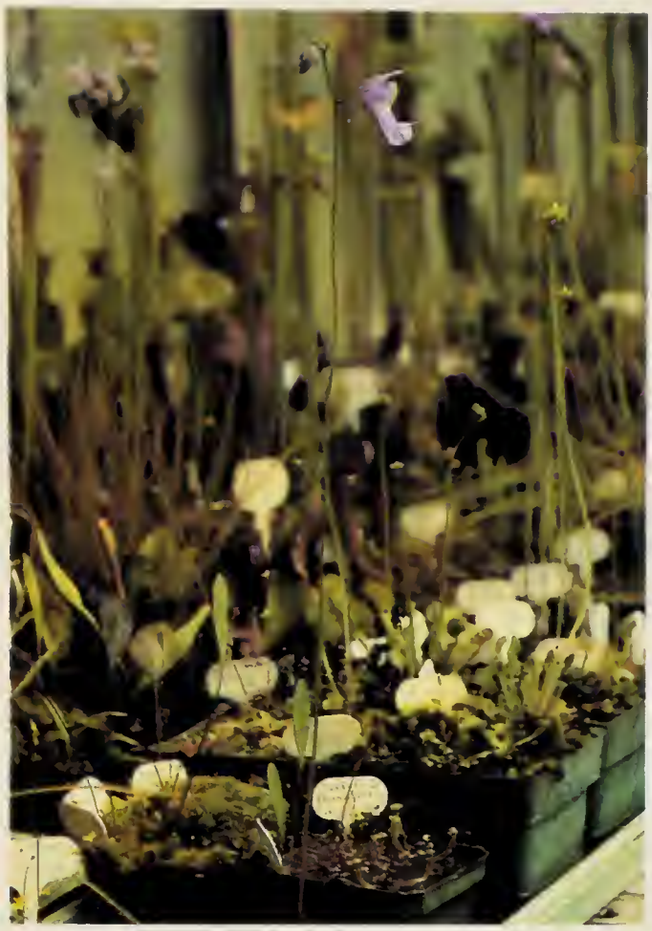
In conclusion, I should be able to make some recommendations but am not sure what to say. My greenhouse is cooled to 40-45° F. at nights over winter to accommodate sarracenia and other North American CP dormancy, and during the warm season the *U.humboldtii* plants are given full sunlight in our quite warm and humid summer conditions here. I would also encourage you to let your plants "run" for effective vegetative growth—That is, let them spread out into water trays from their primary pots via aerial and stolon shoots. As to what caused them to flower, I have no idea, unless it was the rampant growth since the only flowers that aborted were on plants strictly confined to pots. We will see what they do in the future.

I did not have 1.3 meter peduncles with up to 16 flowers each, but hey!—I saw the king of utricularias flower!

References

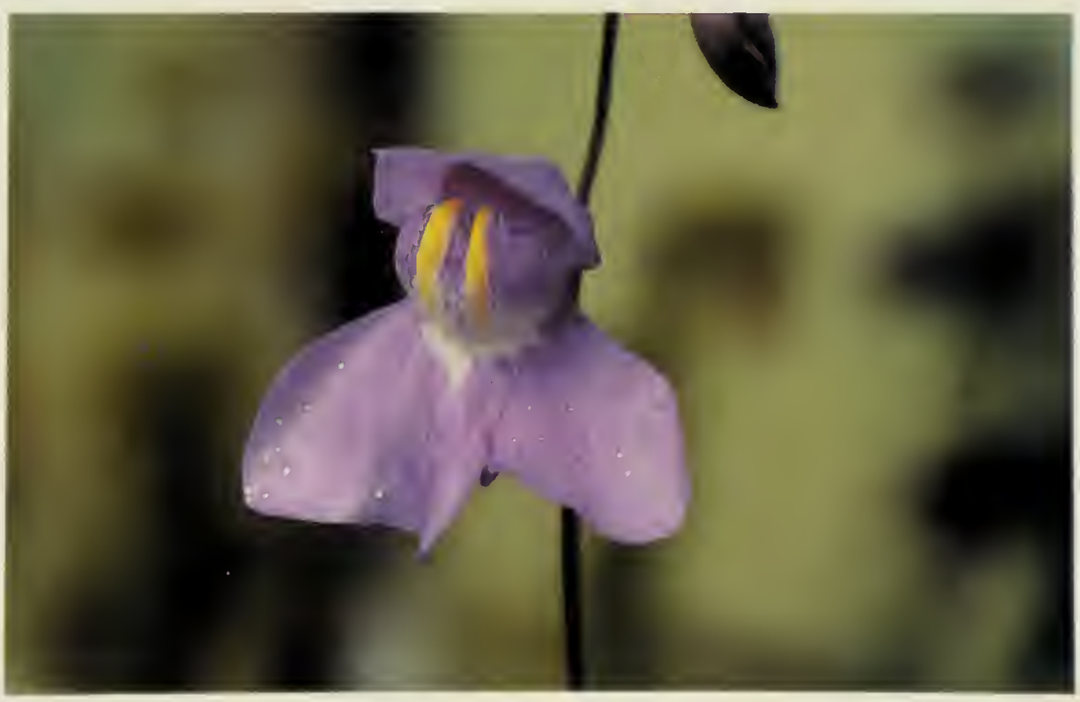
R.A.R.*, 1908. *Utricularia humboldtii.* The Gardeners' Chronicle. June 13, pp. 380-381. (* This publication habitually listed its authors by initials and I have no idea who "R.A.R." was.)

Taylor, Peter. 1989. The genus *Utricularia*—A taxonomic monograph. Kew Bulletin Additional Series XIV, Royal Botanic Gardens, Kew. 724 p. (p. 441-443).



A rather busy shot of *U. humboldtii* flowering in a water tray filled with pots of other CP. The spathulate leaves can be seen poking up here and there between pots.

Side view of *U. humboldtii* with second maturing flower bud on another pedicel. Note the small scale on the peduncle.



Front view of flower of *U.humboldtii*. Superficially it appears much like *U. longifolia* except for size (5.2 cm across) and important morphologic features.

The Australian Pygmy *Drosera* Roster For 1992

By
Allen Lowrie
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AUSTRALIA

Below is the latest list of of *pygmy Drosera* names. The **botanical name** is the valid name. The **field name** is the provisional name given by the author to keep track of the species in question. This field name is only a rough code name and is generally taken from a named settlement near the area of the discovery. It is understood it would be better practice for security purposes not to record any near location details, instead simply number the new taxa *Drosera sp. "3"* , *Drosera* sp. "5" etc. However, it is almost impossible to keep a large list of new species with number codes only listed in your head and be able to recall them for immediate discussion etc. At least with area code names the author has found that instant recall of a new species is possible in 3-D and colour along with a picture of the species surrounding habitat in the mind.

By this area (not number) coding method, it was hoped that new pygmy *Drosera* species discoveries could be made available for immediate gemmae distribution to fellow carnivorous plant growers. In the main this method has worked well by keeping the critical **"True"** location secret until the new species has been validated.

Unfortunately as the author has discovered it is perfectly legal to name a plant from cultivated material which is accompanied by the **"True"** original collection location in the wild. However extremely vague locations, e.g. the author's field names or even worse locations such as "South western Australia" are frowned upon. Sometimes the cultivation method has its place in the botanical naming process. However, this method becomes a low act when it is well known that the validation of the species is in hand by others.

It has been suggested to the author that a better method of new species security is to not release any material until the species botanical name is validated. The author agrees, but this doesn't fit into the true spirit of Carnivorous plant growing and of experiencing the joy of cultivating new species as soon as they are discovered.

The **previous name** is the given name for the species in Carnivorous plants of Australia Vol. 2. by Allen Lowrie, University of Western Australia Press, Nedlands, Western Australia. These names and the botanical Latin spelling corrections will appear in future printings of the book.

Botanical name	**Field name**	**Previous name**
D androsacea		
D. barbigera		
D.callistos	D. sp. "The Lakes"	
**D. citrina*	*D.* sp."Regan's Ford"	*D. rechingeri*
D. closterostigma	*D. sp.* ""Cataby"	
D dichrosepala		
D echinoblastus	*D. sp.* "Camallo"	*D.echinoblasta*
D. eneabba	*D sp* "Eneabba"	
D. enodes	*D. sp.* "omissa-Marchant"	
D. ericksoniae	*D.* sp. "Erickson's-omissa"	*D.ericksonae*

Botanical Name	Field Name	Previous name
#*D. grievei*	*D.* sp. "Baanga-Hill"	
D. helodes	*D.* sp. "Bullsbrook"	
D hyperostigma	*D.* sp. "Platy-O'brien"	
D.Iasiantha	*D.* sp. "Porongurup"	
D leioblastus	*D.* sp. "Steve's-paleacea"	*D. leioblasta*
D. leucoblasta		
D. mannii	*D.* sp. "Bannister"	*D. manniana*
D. miniata		
D. nitidula subsp. *nitidula*		
D. nitidula subsp. *allantostigma*=subsp. "long scapes"		
D. nitidula subsp. *leucostigma* = subsp. "White stigmas"		
D. nitidula subsp.*omissa*		
**D. nivea*	*D. rechingeri* aff."White flowers"	
D. occidentalis subsp. *occidentalis*		
D, occidentalis subsp. *australis* = subsp. "South Coast"		
D. orepodion	*D.* sp. "Armadale"	
D. paleacea subsp. *paleacea*		
D. paleacea subsp. *trichocaulis*		
D. parvula		
D. platystigma		
D. pulchella		
D. pycnoblasta		
D. pygmaea		
D. rechingeri	*D.* sp. "Kalbarri"	*D. coolamon*
D. roseana	*D . sp. "Steve"s*-dichro"	
#*D. sargentii*	*D.* sp. "Esperance"	
D. scorpioides		
D. sewelliae		
**D. silvicola*	*D. sp. "North Bann*ister"	
D. spilos	*D.* sp. "Muchea"	
**D. stelliflora*	*D.* sp. "Walyunga"	

Natural Hybrids

D. nitidula subsp. *nitidula* x *D. ericksoniae*
D. nitidula subsp. *nitidula* x *D. pygmaea* (W.A. form)
D. nitidula subsp. *allantostigma* x *D. ericksoniae*
D. nitidula subsp. *omissa* x *D.occidentalis* subsp. *occidentalis*
=*D.* sp. "Lake Badgerup"
D. nitidula subsp. *omissa* x *D. pulchella*

References

Lowrie, A. & N. Marchant. 1992. New names and combinations in 34 taxa of Western Australian tuberous and pygmy *Drosera*. Kew Bulletin 47(2):315-328.

*= Lowrie, A. & S. Carlquist. 1992. Eight new taxa of *Drosera* from Australia. Phytologia 73(2):98-116.

#=Lowrie, A. & N. Marchant. 1992. Four new *Drosera* taxa from south western Australia. Nuytsia 8(3):323-332

Nepenthes Eymai

By
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There is some controversy over the name of this *Nepenthes* species due to problems common in nomenclature, which we won't enter into here. Briefly, this plant was discovered in 1938 by P.J. Eyma in the mountains of central Sulawesi, but it remained on herbarium sheets until "rediscovered" by John Turnbull and Ann Middleton, and also by Shigeo Kurata, in 1983. The plant is also known as *N. infundibuliformis,* the name given it by Turnbull and Middleton, but Kurata's *N. eymai* seems to now be the accepted epithet. This is one of three plants "rediscovered" by the above mentioned parties. The other two are the equally spectacular, *N. glabratus* and *N. hamatus* (named respectively *N. rubra-maculata* and *N. dentata* by Mr. Kurata).

Nepenthes eymai is a highland variety of the tropical pitcher plant and grows well in conditions for other highlanders, such as *N. fusca* and *N. maxima*, both of which are close relatives of *N. eymai*. I have grown this plant for some six or seven years. It did well for a couple of years as a terrarium plant under lights while in rosette form. The lower pitchers look similar to its above mentioned cousins, but the peristome is more pronounced at the neck, and is striped in the forefront, darkening to a reddish brown where the peristome meets the upwardly inclined triangular lid. The lid has the hook-shaped glandular crest at its base, and a filiform appendage "tooth" at its tip. The wings are prominent. The fuzzy lower pitcher is yellow-brown with reddish-brown blotches and is rather squat.

However it is the miniature upper pitchers that are its hallmark. The plant produces strong climbing vines with evenly spaced leaves alternating left and right. The dainty, fuzzy, funnel-shaped upper pitchers are yellow-green and have a perfectly circular mouth with a narrow, flat, striped peristome. The lid is very narrow and has the prominent glandular appendages of the lower pitchers. There is a significant bulge below the lip, and the pitcher quickly narrows to a rather thick, hollow tube where fluids accumulate before narrowing into the tendril. The trapping mechanism is interesting. Unless flooded by rainwater to the brim, insects seem to fall and get stuck on the sticky inner walls of the pitcher. The secreted digestive juices generally accumulate in the narrow, lower part of the pitcher. Thus insects are not drowned as in most other *Nepenthes*. No doubt the narrow lid allows rainwater to quickly fill the trap to the peristome, and this may aid in the capture rates. I have noticed that even when the plant is crawling with ants, the lower pitchers do a better job at capture than the upper ones.

I grow *N. eymai* successfully in an airy, loose mix of a little bit of everything: orchid bark, lava rock, perlite, vermiculite, osmunda fiber, charcoal, and some long-fiber sphagnum - my typical *Nepenthes* mix. It grows in the greenhouse in a sunny location, with temperatures chilly at night (50 °F. on average) and warm during the day (80 °F). *N. eymai* has done well with occasional winter night temperatures down to 40 °F. and briefly up to 90 °F. on summer afternoons. It strikes with fair regularity from stem cuttings. Like most *Nepenthes* it seems to benefit from occasional fertilizing, being regularly watered with reverse-osmosis water that is quickly drained from the wooden planter box it grows in. I would suggest to those growing it that *N. eymai* be given plenty of room and minimal pruning, so that its climbing stems may grow many feet upwards, showing off its beautiful and strange little pitchers.

Botanical Prints of Yesteryear

By
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Grants Pass, OR 97526

Plant illustration ranges from the purely botanical to the purely artistic. Between these two extremes lies a vast body of drawings and paintings with a combined scientific and aesthetic appeal; botanical records which are at the same time works of art.

There is a wealth of splendid botanical illustrations with which the general public is largely or wholly unacquainted. The extremely difficult and technical craft of botanical illustration requires the illustrator to be both scientist and artist; he is expected to convey an aesthetic impression, and at the same time provide the botanist with accurate information on color, texture and structure.

The greatest flower painters have been those who have found beauty in truth; who have understood plants scientifically, and who have seen and described them with the eye and the hand of the artist. A great botanical artist must have a passion for flowers.

Botanical illustrators were a rare breed, hardy adventurers, as well as individuals who could combine scientific accuracy and artistry with the ability to fit large, awkward plant specimens into a suitable format.

Processes of illustrations are generally divided into three methods: the first is the relief method, where everything on the block or plate is cut away leaving only the surface to be inked and printed. The second is the intaglio process whereby the line to be printed is cut into a groove on the plate. The ink fills the grooves and is forced onto the paper when both the plate and the paper are put through the press. For the third process, the image is drawn (not cut) on to a surface. This method is called *lithography* .

To make an illustration using the woodcut technique, a drawing was made on a plank of hardwood. The wood used was smooth grained, such as cherry, maple or lime, and was cut along the grain. The wood was then cut around the drawing, leaving a raised image on the block. It was a simple and inexpensive process, but had limitations, for it could not readily reproduce the subtle shadings or differences in emphasis.

With an engraving, the image was cut or incised on a smooth and polished copper (and later steel) plate using a tool called a *burin* or *graver* to engrave the design. This is a short, thin bar of highly tempered steel, the cross section of which is triangular so that a diagonal cut across one end makes a "V" shaped point.

When an engraving was completed, the entire surface was covered with printer's ink, and then wiped off. The ink remained only in the carved or recessed lines of the drawing. A piece of slightly moistened paper was pressed against the surface of the plate in the press. The pressure then molded the paper into the engraved lines, and when removed, the ink stood out in tiny ridges on the paper.

Etching is primarily a process of producing the sunken line without the use of a graving instrument. In making an *etching* the artist commences with a smooth polished copper plate. The plate is covered with a protective coating or 'ground' of wax or asphaltum which, when hard, is smoked to darken it. Upon the plate thus prepared, the artist makes his drawing with a needle pointed instrument, exposing, but not necessarily cutting into the copper. By making his drawing, the etcher has much more freedom of individual expression.

When the drawing is complete, the metal of the plate gleams in every line through the protective ground. The next step is the 'biting' of the lines, which is the effect of

From left to right, *N. albo-marginata, N. sanguinea,* and *N. rafflesiana.* From *Flor des Serres*

N. villosa. From *Flor des Serres.*

Sarracenia drummondii (S. leucophylla). From Flor des Serres 10:1071

an acid upon the metal of the plate. The plate is then placed in an acid bath, and the acid allowed to remain and eat away the metal to the depth and breadth of the lines, as may be desired.

These etchings were cheaper to produce than engravings, and therefore were more frequently used in illustrations. Engraving and etching were sometimes used together on the same plate. If a passage required strengthening or a shadow is to be darkened, it is often done by adding engraved lines to an etched plate.

The lithography process was discovered in Germany in 1797 and was developed by 1826, but did not completely replace engravings or etchings until about 1845. In this process an image was drawn on a piece of flat, fine grained limestone with a grease pencil. Then greasy ink, when applied to the water dampened stone, adhered only to the drawn image, which was then transferred to a piece of paper.

It was the lithograph that enabled the artist to draw directly onto the stone, instead of giving his work to the engraver, who then had to cut the design into the metal. Later, a specially prepared zinc plate was used. The illustrative book publishing in the early 19th century owed its tremendous expansion to this innovative, inexpensive technique. Lithography proved much more flexible than engraving, and a skilled lithographer could work much faster than an engraver.

Each method produced a black and white print. Although black ink was standard, sometimes green or red was used as a foundation color. Subtle water colors were then meticulously applied by hand.

This became such a large cottage industry, that a strong labor organization with quality control was developed to deal with the quantity of prints to be produced. A crew of colorists, which were usually women and young girls with an artistic aptitude and who were paid by piecework, worked at tables. Individuals would apply a single color to each black and white print. Delicate camel or sable hair brushes with just a few hairs in them produced the highly detailed work seen in the finished botanical print. An artist's proof served as a guide and the head colorist sometimes added the finishing touches.

One colorist would work on hundreds of prints from the same plate, adding a color at a time, one print after another, mechanically. An expert colorist, working full time, could color several hundred prints in a week depending upon the number of colors and the degree of surface detail of the image.

To prevent obscuring the finely engraved lines, transparent washes of colors were preferred. The water colors used were somewhat rich, yet very subtle. At times a coat of gum arabic was added to those parts of the finished print where a glossy sheen was required to emphasize shadows.

Since the publisher exerted considerable pressure to produce quality prints, a creditable level of care and finish was achieved by most of the women. Still there were oversights, and the low wages did not encourage them to surpass in this precise work. A comparison of several prints of the same plate will often reveal slight variations in the coloring or uneven quality.

By the late 1800's most paper was made from wood pulp. However the paper used for these early botanical prints was made primarily from cotton and linen rags, the traditional source of a strong alkaline paper that stays white and flexible for hundreds of years and often did not discolor. Publishers and printers hailed a complex new process that made paper from wood pulp as a great advance. Chemical bleaches whitened the ground pulp, and a highly acidic alum-rosin sizing kept the ink from bleeding on the page. However, after a few decades, this structurally weak acidic paper began to yellow and turn brittle, which eventually changed or darkened the pigment.

Curtis's Botanical Magazine, a scientific journal renowned in its field, celebrated its 200th anniversary in 1987, making it the oldest surviving botanical journal with hand-colored prints. The *Botanical Magazine* was issued at monthly intervals, each issue

containing three hand-colored engravings with accompanying text.

Curtis's was priced at three levels: uncolored, partially colored, and then the full coloring. In the partially colored, sometimes just a portion of the inflorescence and a leaf would be tinted, as a means of reducing costs.

There were a number of other botanical journals which produced high quality hand-colored prints of botanical specimens. Some of the best known are: *Botanical Register* (1815-37), *Flore des Serres* (1846-57), *Paxton's Magazine of Botany (1834-49), Loddige's Botanical Cabinet* (1817-32) and *Andrew's Botanical Repository* (1797-1811).

Growing CP in Queensland

By
Bruce & Marissa Pierson
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During June of 1992, we moved into our 5 acre property in Hervey Bay, near Maryborough Qld that we had purchased some 18 months earlier. Our move had been delayed by the sale of our house falling through and the need to find a new buyer.

Between March and May 1992, I had taken 4 truck loads of our things to the property, including all my carnivorous plants. I had prepacked the pots into polystyrene boxes so as to make transporting them easier. In all, just over two trailer loads made the 1400 kilometre journey, and the tuberous *Drosera* in packets came up with us in the car in June.

During the spring of 1991, I had been visited by Brian Denton, secretary of the Australian CP Society, who had mentioned seeing Robert Gibson's *Sarracenias* floating in polystyrene boxes in a dam at his parents' property. I decided that this would be a good idea, so I used this method of watering the Sarracenias, VFT and a few other species. The idea was that as the water level in the dam fluctuates, the boxes remain at a constant depth in the water, enabling the pots to set in about 1 inch of water constantly.

For the rest of the CPs, it was a different story and I built a temporary planthouse for them and set up an automatic watering system consisting of a timer and pump. The neighbours kindly kept an eye on this for me in my absence and fixed a small fault that developed with the system.

On arriving, I potted up my tuberous *Drosera* as they had already started growing in small packets in which they had been stored. Despite their late potting, most plants grew reasonably well this season. The climate here is quite a bit warmer than at Albion Park where I had lived for the past 32 years. However, the winter nights are quite cold, getting down as low as 1 °C on one occasion this year. However, the days are very warm and temperatures under 20 °C are not very common.

It appears that winter here is still cold enough to give plants requiring a winter rest, their dormancy. Sarracenias have started growing in late August, which may be a week or two later than average for Albion Park. The colder nights due to clear skies may prolong the dormancy period, despite the warmer days.

On our property here, we have several native CPs growing; *Drosera burmanii, D. spathulata, D. pygmaea,* a tuberous species in the *D. peltata* complex-*D. spathulata* "aurictata", *Byblis liniflora* and *Utricularia lateriflora.* I also found what appears to be a very tiny annual *Utricularia* species, which I have not been able to identify at this stage.

I have also planted a few non-native CPs near the dam,and so far, most appear to be growing reasonably well, but time will tell as to how many types will grow in this soil here. So far *Dionaea, Drosera binata* var *dichtoma, Cephalotus, D. filiformis var filiformis, D. adelae, D. slackii* and a few Sarracenias have been planted out. Others will follow as time permits.

Anyone wanting to contact CARNIVOROUS SUPPLIES or Bruce Pierson, formerly of P.O. Box 179 Albion Park, NSW 2527 Australia should now write to: Bruce Pierson, Lot 5, Riverpark Court, Riverview, QLD 4650 AUSTRALIA.
We still have a range of CP seed available for sale or trade, although it will be some time before the nursery is in full swing, due to getting resettled.

The Discovery of a New *Pinguicula* from Ayautla, Oaxaca, Mexico

By
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In early 1987 I tried to get through the new road from Jalapa de Diaz, to Huautla de Jimenez where I looked for new plant material. One *Cycadacea* in particular I wanted to photograph in habitat, *Dioon rzedowskii*. There were rare species of palms in the genus *Chamaedorea* close to the Rio Uruapan. I followed the river with several children from Jalapa de Diaz who in the process got lost and spent the night close to the waterfalls. At around 2 a.m. we found them again, sound asleep in the crevices of eroded rocks. At the entrance to the cave where Rio Uruapan begins(there is no trail to the area as the people believe that the river is bewitched), we collected a new *Peperomia*, and beautiful specimens of *Tetranema mexicana* (Allophytum) which were in full bloom in the huge hollow from which the water proceeds. It is surprising that this plant can thrive with such little light. Around the large cave, but out of reach, I saw big, yellow blotches of leaf rosettes which undoubtedly were those of *Pinguicula* with flowers that resemble *P. agnata*.

Because of the oncoming darkness we could not explore in more detail. A few months later the dirt road was dry enough to travel to Ayautla. I scanned the almost vertical wall of Cerro Rabon on the approaches and was surprised at the large populations of a form of *Agave attenuata* in an area of 3000 mm rainfall annually. Approaching the Mazateco Indian village of Ayautla, one of the most picturesque in the State of Oaxaca, I noticed big blotches of yellow and asked the Indian boys who accompanied me for my binoculars. There were these large Pinguiculas again, in fully exposed rock in the heat of the tropical sun. We climbed the steep hill until we reached the wall. Together with this fabulous Pinguicula we also admired marvelous specimens of *Tilland-*

Habitat of the large *P.* from Ayautla, Oaxaca (right)

Close-up of the large *P.* from Ayautla, Oaxaca

stick is on the whole plant and not only on the upper sides as in other examples of this genus.

It is to be assumed that the species grows on the south side of the steep walls from Rio Uruapan and its source until above Ayautla where the walls peter out. The plant can easily be propagated by leaf cuttings and seed It is robust and withstands the hardest rains since it is well attached to the walls.

sia streptophylla. Some of the best climbers of our boys reached the plants where photos were made which turned out to be spectacular. What was unexpected: The leaves catch insects on the upper and lower sides, which means that the substance to which the insect

Insect trapped on the **underside** of the leaf.

The Possible Functions of the Thorns of *Nepenthes bicalcarata* (Hook. f .) Pitchers

By
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The tropical pitcher plant, *Nepenthes bicalcarata* Hook. f., is a common plant in the great peatswamp forests on the northwest coast of Borneo. It is readily distinguished from all other *Nepenthes* by the two large thorns (or "fangs") which protrude downwards from the base of the pitcher lid (Figure 1). These thorns may attain lengths of three centimetres on large specimens, and some of the largest pitchers may have a capacity of more than half a litre. Both the lower and upper pitchers possess the thorns. In terms of the plant (rather than the pitchers), *N. bicalcarata*

Figure 1. (right) An upper pitcher of *Nepenthes bicalcarata* Note the two thorns below the lid. This pitcher is about 12 cm in height.

is physically the largest *Nepenthes* species, with leaves up to one metre long and stems which may reach 20 metres in length, and four centimetres in diameter.

Various functions have been suggested for the thorns, the best known theory having been put forward by Burbidge (see Slack 1979), who suggested that the thorns protect the contents of the pitchers from arboreal mammals (such as tarsiers, lorises and monkeys), which reach into other *Nepenthes* pitchers and feed on the contents. The thorns would certainly prevent a mammal such as a tarsier from doing this to *N. bicalcarata* pitchers. Dodd (1982) discussed possible roles for the thorns of *N. bicalcarata*, and although he did not come to any conclusions as to their function (if any), he did not think that they played any role in catching of prey by the pitchers.

In 1989 and 1990, I had the chance to perform field research on a number of lowland *Nepenthes* species in Brunei Darussalaam, a small country on the west coast of Borneo. One of these species was *N. bicalcarata* . After observing the plants for several months, I came to the conclusion that the thorns have no role in protecting the pitchers' "catch", because monkeys and tarsiers which feed from pitchers do so by ripping the pitchers apart (at the sides), rather than by reaching in through the mouth. Pitchers of *N. bicalcarata* were not spared from this fate, though the frequency with which they were damaged was considerably less than for other species, such as *N. rafflesiana* Jack.

I also noticed that many insects (crawling and flying) visit the pitchers and crawl onto the thorns to feed on nectar which accumulates at their tips. These insects, particularly larger ones such as cockroaches, often experience difficulty in maintaining a foothold whilst on the thorns. It is also noteworthy that the tips of the thorns are nearly always positioned over the centre of the pitcher mouth. Insects which lose their foothold while crawling over the thorns fall straight into the pitcher fluid,without touching the sides of the pitcher.

I was unable to perform any experiments to determine whether or not the principle role of the thorns is to assist in the catching of prey, but my observations suggest that it may be. It is certainly not true that the thorns of *N. bicalcarata* serve to protect the pitchers' prey from marauding mammals. Having eliminated one hypothesis, I am afraid that I cannot provide anything more than circumstantial support for another! It would be most interesting to perform field-based experiments to find out the exact function of these thorns, if indeed there is one.

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Want Ad

Rob Maharajh (168 Dalewood Ave. South; Hamilton; Ontario; CANADA L8S 1Z4. Tel. 416/526-9600. Bitnet address: MAHARAJH@McMASTER.CA.)
W: *D. alba, D. acaulis, D. affinis, D. burkei, D. cistiflora, D. pauciflora, D. glabripes, D. regia, D. neocaledonica.* I would like to contact and trade with collectors who grow rare South African and tropical African *Drosera*.

Some Observations of Carnivorous Plants in Habitat, Sulawesi: Indonesia

By
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During a trip to Indonesia in July, 1992 I travelled to the highlands of the island of Sulawesi (formerly Celebes) in the country of Indonesia. Located at an elevation of 4000 feet, the largest highland city is Rantepao. The inhabitants of this area are called the Toraja people and are famous for their unusual boat shaped houses, rice cultivation and elaborate funeral practices.

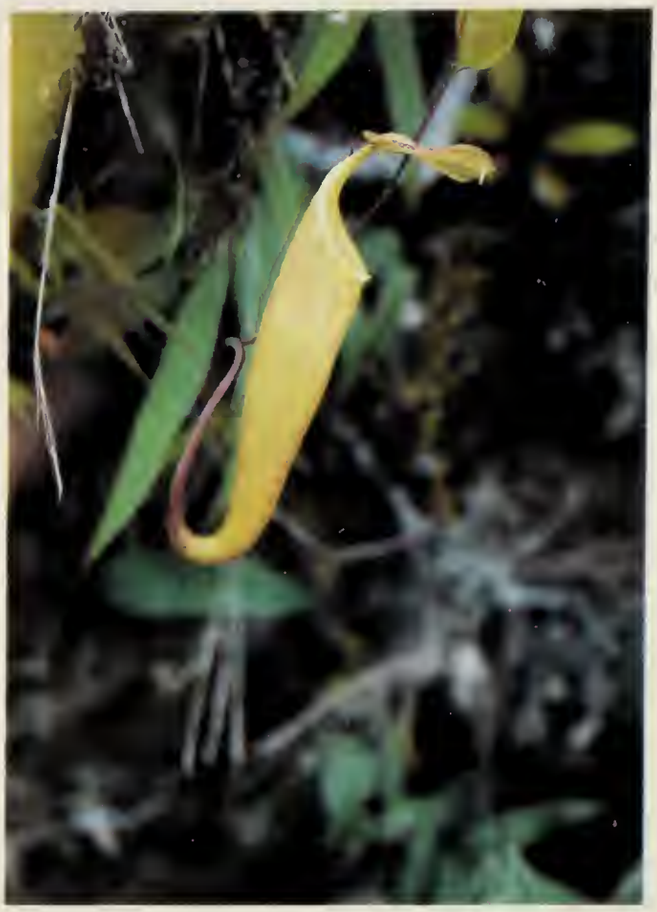
The human population of Torajaland is increasing rapidly. As the population increases, less land is available on a per capita basis for providing sufficient food for all of the people. In an effort to reduce the numbers of people, the Indonesian government has embarked on a transmigration project. Toraja people on a voluntary basis are translocated to other less crowded islands in Indonesia such as Iryan Jaya, Borneo and Sumatra. This program together with efforts at family planning has begun to help stabilize the population of Sulawesi.

The climate around Rantepao is relatively mild with cool evenings, warm days and rainfall nearly every afternoon or evening. Rice is cultivated on all the hillsides and valleys. Elaborately constructed terraces cover nearly every square foot of cultivatable land. In order to find any of the original vegetation, it is necessary to climb above the cultivated valleys into the steep limestone mountain slopes where it is impractical to cultivate rice.

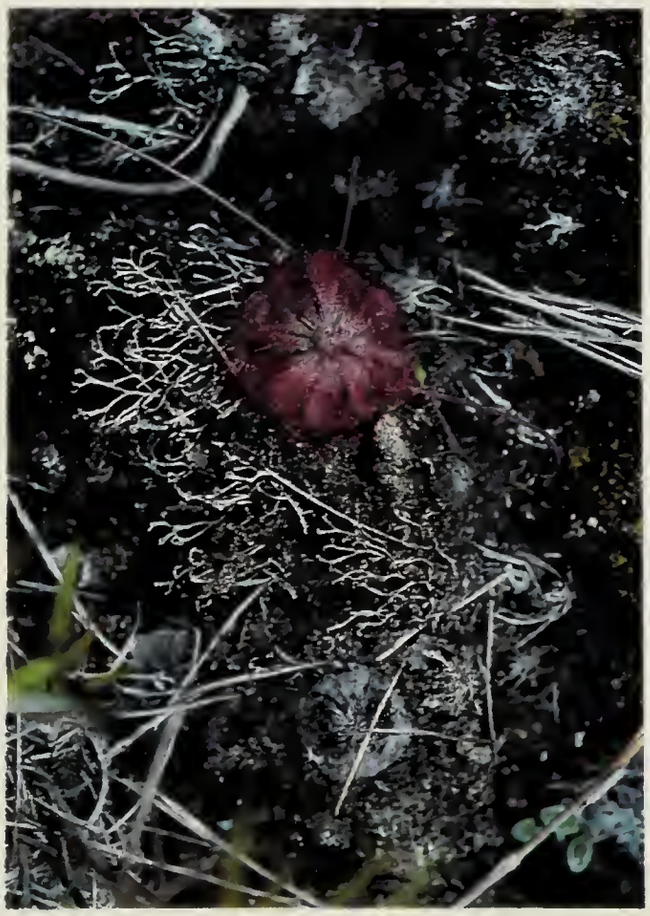
On one day during my visit I drove close to the village of Batutumanga at an elevation of 4400 feet. As the road deteriorated, I parked the vehicle near some rice fields and set out walking along a very bad, muddy road to the village. As I approached Batutumanga, scattered groups of trees appeared and some of the natural vegetation was found. Along the I road stopped to admire some ground orchids in bloom and noticed two different *Nepenthes* spp. growing on the side of a small cliff. The soil was quite wet where a spring ran onto the surface and there were many mosses, ferns and other water loving plants. The steepness of the slope was the only reason this small area had not been brought into rice cultivation.

Each of the *Nepenthes* had very different leaves and pitchers. Growing with them were also some bright red *Drosera* spp. At a place where part of the cliff had collapsed in recent rains it was possible to find a few examples of the insectivorous plants which were collected. The plants were transported back to the hotel where I was staying. The plants were carefully washed to remove all soil and the leaves and roots were trimmed back. The *Nepenthes* rhizomes were carefully wrapped in moistened newspaper and somehow survived for nearly two weeks of travel enroute back to the United States. The plants were brought into this country via permits from the United States Department of Agriculture. After unpacking, the plants were packed in wet sphagnum and handed over to Leo Song at California State University, Fullerton, where two of the *Nepenthes* have rooted in the greenhouse. Unfortunately, none of the *Drosera* survived the journey home.

It is sad to think that huge numbers of these interesting plants once grew all over the mountains where now rice cultivation occurs. While these plants were observed in habitat during a very short visit to the area, it would certainly be interesting to return and climb higher into the uncultivated hillsides to see what other types of unusual plants might be observed.



Nepenthes spps. in habitat in Torajaland, Sulawesi, Indonesia. All photos by author.



An unidentified red *Drosera* growing in Torajaland.

What Are the Nearest Noncarnivorous Relatives of the Carnivorous Plants?

By Stephen E. Williams
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How many times did the carnivorous syndrome arise in plants? Do Croizat's ideas of a single origin of carnivorous plants have any merit? Is the Sarraceniales of Engler which groups *Sarraceniaceae, Droseraceae*, and *Nepenthaceae* together a natural group? The Nepenthales of Cronquist includes the same three families as Engler's Sarraceniales but the Nepenthales of Takhtajan excludes *Sarraceniaceae*. Which expert should we believe? Are the families of carnivorous plants natural ones? Does *Heliamphora* belong in the *Sarraceniaceae?* Does *Dionaea* belong in the *Droseraceae?* Finally, what are the nearest noncarnivorous relatives of the various groups of carnivorous plants?

For many of the carnivorous plants these problems have been hard to answer until now because of the extreme modification and possible parallel evolution of the vegetative parts of the plants and the possession of very similar rose like flowers by so many of the plants. There has been a tendency to place them together because they are carnivorous and to be conservative about placing them with other plant groups but they are ordinary flowering plants (albeit ones with extraordinary feeding habits) and must be more closely related to some noncarnivorous plants than they are to others.

Until fairly recently authority ruled when it came to plant groupings above the genus level. That is still so today but methods are being developed which appear to be able to provide an objective estimate of the degree of relatedness of plants at the family level and above.

This article is based on information already published in Albert, V., S. Williams and M. Chase (1992) Carnivorous Plants: Phylogeny and Structural Evolution. Science 257: 1491-1495.

As a plant physiologist interested in comparative physiology of the *Droseraceae* I have always wanted to know what the closest noncarnivorous relatives of these plants are. Several authorities (Takhtajan, Thorn and Dahlgren) have suggested that there is a relationship to the order Saxifragales but Cronquist, who when he died last year was the greatest botanical authority in the USA, suggested a relationship to the Violales and placed the group in a different subclass than the other three botanists. My chance to have a hand in solving the mystery came when I spent my sabbatical last year working at University of North Carolina at Chapel Hill (UNC) with Victor Albert, Hal Hills and Mark Chase, using methods involving cladistic analysis of DNA sequences. While the results cannot yet be considered the last word, they indicate that answers to many of the questions can be found and give a very good estimate of what they are likely to be.

The methods are fairly simple but require some explanation. Consider that the information in a gene is information, just as the information in a book is. The cells faithfully copy the information each time they divide, passing the information on from generation to generation. If we view cells as illiterate scribes who copy manuscripts without knowing their meaning we expect the scribes to make typos or errors in the manuscripts. These errors are in turn faithfully copied later. In some instances the editor (natural selection) eliminates certain passages which prevent the cell from working properly but many of the errors survive editing and leave a record of the history of the gene. Since all plants descended from a plant with an error will faithfully

copy the error, it is simpler (or "more parsimonious") to assume that an error arose once than that it occurred several times. Teachers often use the principle of parsimony when they assume that two term papers with identical spelling and grammatical errors in the same awkward sentences had a common origin!

Using the record of typos we could predict which manuscripts were copied from a common source and make a reconstruction of the order in which the text of the manuscripts deviated from each other. The result can be drawn as a genealogical tree with hypothetical "ancestral" manuscripts at the nodes and real ones at the tips of the branches. This is just what the scientists in Mark Chase's lab at UNC were doing with the DNA from the chloroplast gene rbcL, only their tree included 500 species of seed plants from cycads and ginkgo to orchids and asters. The tree they obtained is reasonable in the sense that it is much like the traditional classification system and that most groups that are considered natural ones by the majority of taxonomists were consistent with the DNA data. There were also some surprises but even these when viewed carefully often made sense in terms of morphological and phytochemical characteristics of the plants.

When I started to look for a sabbatical project which would use DNA data to infer which group of carnivorous plants was most closely related to *Drosera*, Joe Mazrimas told me that he had sent a number of plants to Victor Albert and Mark Chase. I called Vic and Mark and arranged to join them in their research. They had already sequenced *Drosera*, *Nepenthes*, *Sarracenia*, *Roridula*, *Pinguicula* and *Utricularia* and included them in the universal seed plant tree mentioned above. When I began working with Vic and Mark the tree had 250 species instead of 500 and it was just beginning to look as if a sensible tree could be generated from the data that was rapidly gathering in laboratories around the world.

As far as the carnivorous plants go it seemed logical enough that *Pinguicula* and *Utricularia* were right together and that they were near the Scrophulariales which have very similar flowers. It was also interesting that *Drosera* and *Nepenthes* were together and a bit strange that they were near such plants as spinach and amaranth and not Saxifragaceae where many people have thought they belonged. It was still unclear how much the method could tell us about the relationships of the taxa we were interested in. Don Schnell generously supplied the first samples I worked with and Steve Smith who was nearby in Climax NC provided a lot of material that allowed a good start. Rob Gardener of the Carolina Botanical Garden was also a great help but the bottleneck on plant material really ended when Don Schnell suggested that I get in contact with Ron Gagliardo who has numerous carnivorous plants in tissue culture. Ron was located at North Carolina State a short distance away and was very cooperative. Much of the work with *Drosera* was possible because of Ron's generosity. *Drosophyllum* from Joe Mazrimas and *Darlingtonia* from Peter D'Amato helped round out the genera which Vic had not been able to get hold of previously. Generous donations were also made by John DeGreef and Gordon Snelling.

As we added more species of carnivorous plants to the study, the universal tree also gradually grew from 250 species to 475 species and finally to 500. At this point several relationships became clear.

The DNA data indicated that *Drosera* is distantly related to the order Caryophyllales (a group which includes carnations, spinach, amaranth, pokeweed and cactus) and that it is more closely related to the Plumbaginaceae (which includes the woody ornamental plumbago), Polygonaceae (the family which includes buckwheat and rhubarb) and to *Nepenthes*. *Plumbaginaceae* have sticky mucilage secreting hairs which are quite similar to those of *Drosophyllum*, *Drosera* like flowers and plumbagin, a napthaquinone common to *Drosera*, *Drosophyllum*, *Dionaea*, *Aldrovanda*, *Nepenthes* and *Tripyophyllum*.

The data indicate that *Sarracenia* (except for being a dicot) was not even remotely

related to either *Drosera* or *Nepenthes*, where it has sometimes been placed, but instead it is a relative of the Ericales, the acid loving group that includes several parasitic plants as well as rhododendron, blueberries and cranberries. The data indicated *Roridula* is fairly closely related to *Sarracenia* and, of course, *Darlingtonia* and *Heliamphora* are even more closely related. The position of *Roridula* was a complete surprise to me since Francis Lloyd had declared that it was not a carnivorous plant in 1929 but since it seems to be related to *Sarraceniaceae* it is clearly of interest whether or not it is carnivorous. The whole question of carnivory of *Roridula* should be reinvestigated.

As might be expected the DNA data placed the members of the *Lentibulariaceae* (*Utricularia* near *Pinguicula*) together and confirmed their relationship with the Scrophulariales which also as has been proposed previously. *Proboscidea*, a sticky haired non-carnivorous plant with bilaterally symmetrical (zygomorphic) flowers is more distant but also fairly closely related to *Utricularia* near *Pinguicula*.

When *Byblis* too turned out to be near *Utricularia* and *Pinguicula* in the tree it startled us. The flower of *Byblis* looks radially symmetrical (actinomorphic) as opposed to bilaterally symmetrical and it did not seem that it should be placed here. However the *Byblis* flower is not strictly radially symmetrical since the stamens hook downward. The hairs of flypaper leaves of both *Pinguicula* and *Byblis* look nearly identical. The exact position of *Byblis* is still a bit unclear. It may be only remotely related to *Utricularia* and *Pinguicula* or it may be fairly closely related. More data needs to be analyzed to determine its exact position.

The data place *Cephalotus* all by itself. It is not particularly close to any other group of carnivorous plants. Its closest relatives are a number of plants endemic to Australia, New Zealand and Chile. It is remotely related to *Oxalis,* the common lawn and greenhouse weed.

Brocchinia is a bromeliad. As expected, the bromeliads formed a branch within the monocots in the study with 500 taxa. We did no further work on it but there is a report by Givnish, Systma Smith and Hahn (1992, American Journal of Botany 79:145 [abstract #416]) that DNA restriction site studies (which are a different method than our rbcL sequencing studies) show it to be related to the bromeliads *Brewcaria*, *Lindmania*, and *Navia* which with *Brocchinia* are all native to the Guyana Shield. This cluster of genera is most closely related to *Fosterella*, a mesophytic Andean genus. All are in a clade with the subfamily Pitcairnioideae (Bromeliaceae).

The work with DNA is in its infancy and changes in some details of what is described above are likely. The combination of cladistic analysis and DNA sequencing is a powerful tool and I believe within a few years we will have a much firmer understanding of the relationships of carnivorous plants with other plants than we have had in the past.

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Solution to the Problem of Short Vitality In Seeds of European Butterworts

By
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Czech Republic

Members of CP-societies usually obtain seeds from seed banks or from botanical gardens. Unfortunately, the seeds may be several months old. The seeds of European *Pinguicula* species especially often have reduced vitality. According to my own experience, vitality is decreased from nearly 100% to 70% after 7 months if the seeds have been sheltered in paper bag. The seeds are completely dead after 14 months. I have started many experiments with *Pinguicula bohemica*, studying methods of handling seeds of European butterworts.

I can confirm the statement of other authors that a cold period, so-called stratification, is necessary to germination if seeds have been sown on the surface of wet soil. About 4% of the seeds are often so light dormant that they can germinate without a cold period.

My first surprising experience was that seeds of butterworts, which have been submerged into pure water can germinate within a few days. No cool period is necessary, and germination may be accelerated by shaking. Light is also necessary (cf. Kinzel 1927).

How to explain this effect? Dormancy is chemically controlled by an inhibiting substance, namely abscissic acid (ABA). The substance may be either enzymatically removed during a cold period or it may be dissolved and washed away off the seed coat by quantities of water (Fellenberg 1978). The same effect is known in celery seeds according to the literature (Hovadik et Kratochvilova, 1977). The described germination in water is blocked if light is absent. The second step in my experiments was based on the question :how long a time can the wet seeds be kept in darkness?

Seventy percent of seeds kept 3 years in water can germinate. The seeds of *P. bohemica* in my experiments were vital even after 5 years. Twenty-four percent of them germinated into good seedlings when they had been exposed to light. Germination is possible even during short winter days because seedlings are not photoperiodical as mature plants (cf. Isikawa, 1954). The following property of seeds is very interesting: Being kept for a very long time in water and darkness, they gradually lose light dependence and more and more of them start germination in darkness. Such an effect is also known in other seeds (Fellenberg, 1978, Sebanek et al., 1983). I came to following conclusions:

1) We can collect fresh seeds and send them in paper bags, but only up to 6 months without risk.

2) A good method for storing the *Pinguicula* seeds for a long time is to keep them in water and in full darkness. Vitality of the seeds can be prolonged by cold conditions. But remember please, that seeds submerged in water and which have therefore lost the inhibiting substance cannot hereafter tolerate frost.

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Darlingtonia californica

A botanical drawing by Alex Mrkvicka

ALEX MRKVICKA of Vienna has sent in the botanical drawing of *Darlingtonia* on the back cover. His purpose was to show development of juvenile leaves and runners, along with a few other details around the border.

Beginning in the left upper corner and proceeding clockwise, he shows a flower without petals (stigma view), a flower without petals (lateral view), an intact flower, a maturing seedpod, an entire plant with developing runners extending toward the center of the drawing, three juvenile leaves developing, tip of underground runner developing plantlet, juvenile plant or seedling, and a seed.

This style of botanical illustration was very popular before the days of photography, and in some ways often shows more detail and interesting relationships than a photo.

Collect or Not Collect From the Wild: Conservation

By
Don Schnell
(Rt. 1, Box 145C, Pulaski. VA 24301)

As we see more CP species and good CP habitat becoming endangered or threatened, there is naturally concern about collecting from the wild. Ordinarily, habitat destruction wreaks more havoc than individual collections providing we are not talking about public lands, preserves or private property without permission. However, as good habitats become fewer and smaller, massive wholesale collecting from any lands for huge sales of plants into new markets increases, and certain species such as *Sarracenia oreophila,* are becoming so rare that individuals remaining can almost be numbered and counted, casual collecting can become a real problem.

The American Rock Garden Society(ARGS) is confronting the same problem with species and habitats of interest to them—often overlapping with our interests!—and appointed a committee to come up with a statement of policy on collecting from the wild. One of the members was CPN coeditor emeritus Larry Mellichamp. The committee was quite diverse consisting of those who categorically opposed collecting at the outset, those who collected, and attitudes in between. This same span of attitudes toward collecting, of course, reflect similar feelings among individual members and the botanical community as a whole, and I am certain, our society as well. The ARGS committee came up with a policy, understandably after much spirited discussion. The policy appeared in the Bulletin Board, supplement to the ARGS Bulletin of Summer, 1992(Volume 50, No. 3). We were struck by the reasonable and balanced nature of that statement and asked for and received written permission from the ARGS president to adapt the policy to ICPS. The operative word is "adapt" since what appears below is not entirely the original statement as adopted by ARGS, but has many changes and additions applicable to our society. If you wish to compare our statement with the original, by all means consult the above reference. So, we thank ARGS for their generosity in allowing us to adapt their framework, and their effort in conceiving the project and carrying it through. Any changes that seem to us appropriate to our CP and possibly not entirely to rock garden plants are our responsibility.

We would hope our members will take these concepts to heart and consider them when going to the field to collect or when transplanting in habitats, and even when selecting dealers where you will purchase plants. The co-editors in their capacity of interim ICPS officers approve this policy. We would appreciate your comments.

ICPS Policy Statement on Plant Collection

1. ICPS is dedicated to understanding, preserving, growing, selecting, propagating, studying, and appreciating the natural flora of the earth with special interest in carnivorous plants.

2. Above all, we support efforts to protect wild habitats as the sources for genetic variations and naturally thriving plants for generations to come.

We believe habitat destruction, both planned and accidental, is responsible for the greatest loss of habitats and species in the world today and we deplore this situation.

We strive to support those organizations around the world that seek to preserve valuable wildlife habitats, and we support field and media education as effective

means of instilling respect for natural habitats.

We also support the efforts of legitimate organizations that preserve genetically broad spectrum samples of threatened and endangered species as living material with a view to replanting existent or reclaimed habitat.

We discourage introduction of plant species into habitat where that genetic material has not or does not occur naturally unless for closely monitored research purposes with a view to eventual removal of the inappropriate material and prevention of crossbreeding with naturally occurring plants while the study is in effect.

3. We are against the wholesale collecting for resale of wild plants from public lands, especially the rarer plants and abhor the practice of misleading the public by calling such collected plants nursery propagated by any stretch of the definition.

4. Except in the instance of public lands, private lands and preserves without express permission, and very rare species where individuals are numbered, we support the practice of knowledgeable and responsible individuals collecting seeds, cuttings or divisions of wild plants for the purposes of growing, studying, selecting, hybridizing and ultimately propagating the plants and distributing to other growers.

We recognize that without experienced people with horticultural and/or botanical interests selecting and propagating species from the wild, there would be fewer choices of propagated horticultural material and consequent increased pressure on wild habitats with illegal or inappropriate collecting, and there would be less knowledge gathered on the nature of the plants.

We would encourage collectors to be responsibly aware that rare plants merit special consideration and should not be distributed or propagules taken unless there is a sufficient local stock to successfully perpetuate the population. In most cases this means minimal or no collecting of rare material.

Further Notes on *U. calycifida*

By
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In CPN 21:1—2, I wrote on forms of *U. calycifida*. I have since found that forms 'Spotted flower' and 'Purple veins' self and breed true but crosses between them have yet to provide viable seed. While one could argue that my failure to obtain seed from this cross suggests the forms are different species, I do not. I think the lack of success is due to failure on my part in this delicate procedure, and not because of a genetic barrier. I will continue trying. I have also obtained from Christoph Belanger a few other clones of this plant, especially one ('Mauve flower') which has foliage the same as 'Purple veins' and similar large flowers. The lower lip of its flowers has a reticulated pattern in the proximal palate region similar to the spots on 'Spotted flower.' I consider 'Mauve flower' to be a plant intermediate between 'Purple veins' and 'Spotted flower.' In this perspective, it argues against a species or even subspecies distinction for those two *U. calycifida* forms. Lastly, I have heard of white flowered forms in cultivation.

New CP Cultivar Received in 1992

By
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***Sarracenia oreophila* 'Don Schnell'**

Designated by Peter D'Amato, California Carnivores, 7020 Trenton-Healdsburg Rd., Forestville, CA 95436. This selection is from a collection grown from seed from a *Sarracenia oreophila* population found near Sand Mountain, Alabama. These seedlings were grown by Bob Hanrahan of World Insectivorous Plants in the early 1980's and were widely distributed. They are known for their pronounced red venation and large mouths.

S. oreophyla 'Don Schnell' is noteworthy for its highly veined tube and hood, and deep red throat, interior upper tube and lip. Mid-summer phyllodia are typical of the species. The cultivar is on display at California Carnivores nursery, Forestville, California, and is named for Donald Schnell, noted *Sarracenia* authority.

***Sarracenia* 'Judith Hindle'**

Designated by Peter D'Amato, California Carnivores, 7020 Trenton-Healdsburg Rd., Forestville, CA 95436. This selection resulted from crossing *Sarracenia (leucophylla X flava "rugelli") X.S. purpurea* "chipola." The cross was made by Alan Hindle in 1985. In *S.* 'Judith Hindle', the young trumpets are green, laced with yellow, with a green and white ruffled hood. They soon darken to deep plum red with white, yellow and green mottling in the hood. The paler coloration turns pink as the pitcher ages.

The cultivar is on display at California Carnivores nursery, Forestville, California, and is named for Judith Hindle, Alan's wife.

Photos by David Johnson.

S.X. 'Judith Hindle'

S. oreophila 'Don Schnell'

Byblis—Notes On Forms New To Cultivation

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Because of the efforts of our intrepid colleague Allen Lowrie of Western Australia, there are some new forms of *Byblis* in cultivation (*B. liniflora* aff. 'Darwin,' 'Kununurra,' and 'Robust straggling plant, Darwin'—hereafter 'Darwin,' 'Kununurra,' and 'Robust,' respectively). During the past few years I have been growing them and learning about their cultural requirements. *Byblis* is a genus of passive flypaper plants similar to *Drosera*—indeed the species *D. indica* looks much like a *Byblis*. The major characteristic distinguishing the two genera is in the arrangement of the floral sexual organs. In *Drosera* the five stamens are arranged symmetrically around the ovary and there are five (often branched) styles also symmetrically arranged. In contrast *Byblis* flowers are subtly zygomorphic. The five stamens are grouped together to the side of the ovary—the five curved anthers looking like a bunch of bananas—while the single pistil extends away from the bundle of anthers.

The most commonly grown plant in the genus is *B. liniflora*. This is certainly the easiest plant of these to grow because its seeds germinate and grow in any medium without any special treatment. I prefer to use a 50/50 sand/peat mix in a deep pot because the plants live longer. In smaller pots they tend to be annuals. In big pots they also branch more to make a bushy plant, especially if just a few plants are grown in a pot. The first flowers appear when the plant is just a few months old, and seed is produced generously without intervention—this plant is a weed!

B. gigantea is more challenging. The seeds must be pretreated in order to germinate well. I have tried boiling water, bleach, gibberellic acid, and patience, but I have found the best way is by fire! The sort of fire you need to produce is a cool burn. I gather some completely dried grasses and straw and make a loose pile on the soil surface of my pots, several centimeters tall and broad. When I light the fire I puff on it so it burns vigorously for about 20—30 seconds before burning out. When I set fires for seed in plastic pots I first bury the pots to the rim in large buckets filled with moist sand. This prevents the plastic pot from melting. Because I'm a little paranoid about the effects of unknown variables, I always use dead grass from areas I know haven't been treated with pesticides or herbicides. I think it may be important to let the seeds sit on a moist soil surface for a week or two before they are fire treated. Germination should follow in a few weeks. While Adrian Slack in foggy England and other growers in humid environments may need tuning forks to induce the anthers to release pollen, I have found this is not necessary in my 60% humidity Arizona greenhouse. Holding the flower petals with thumb just under the mature stamens I briskly rub or flick the anthers a dozen or more times. Pollen collects on the thumb. Tuning forks will also work but are a bother.

'Kununurra' needs no special treatment to germinate, and is catholic regarding soil mixes. It is a lanky form with a weak stem and large internode distances. It grows to a meter or more long, generally causing problems as it scrambles though the tops of my *Sarracenia*. Often the entire plant is pale green. It grow best in pots 15 cm (6") or more deep. I have grown this giant in 5 cm pots (2") housing four plants, but the plants were dwarfed in all respects to about one half normal size. These plants also became tinged with red color overall. 'Kununurra' needs a tuning fork or similar method (such as mine above) to release pollen. Cross pollination is required for it to

set seed. This means you must have two plants flowering approximately concurrently. Self a plant all you like, but you will get nothing for your labours. The flowers on 'Kununurra' are very large (2—3 cm across), which are about as big as on *B. gigantea*. The petals on the largest flowers are clearly placed in a zygomorphic arrangement. Two of the petals are paired on one side of the flower, and the other three are grouped on the other side of the flower, very much like on most Mexican *Pinguicula*. The petals on smaller flowers do not show this asymmetry.

'Darwin' must be exposed to fire to germinate well. When I first tried to germinate this plant I did not use fire and nothing happened. A year later I tried another batch of seed and got rapid germination after an experimental firing. Heady with success, I fired the old pot which had been sitting moist in a tray for a year and got more seedlings! This plant has a compact bushy habit with many small flowers. The entire plant is deep red. 'Darwin' will self naturally and produce seed. I made a delightful discovery about 'Darwin' when I was collecting seed for the first time. At the time I was mildly annoyed because the seed capsules do not split open when they dry out at maturity. Instead they stay firmly sealed. Since the capsules are sturdily made, this makes collecting seed a little irritating because each must be forcibly but carefully smashed without losing seed. But I noticed one of the seed pods still on the plant had opened widely without my intervention. Thinking about how Erodium, *Lithops* and other plants use moisture as an aid in seed dispersal, I dunked a sealed 'Darwin' seed capsule in water and was delighted when, a few minutes later, the capsule halves splayed open to reveal the seeds within, like a mussel opening at low tide! 'Darwin' is a wonderful plant to think about—it requires water for seed dispersal and fire for germination. I wonder if a brush fire swept through 'Darwin' habitat, would seeds locked in dry capsules survive the conflagration and be liberated when their capsules burn away? Thus heat treated, they would be ready to germinate. This is similar to a fire survival method some pines trees have—their tough cones do not release seed until a fire opens them.

B. *liniflora* and 'Kununurra' both have small seeds and do not require a fire treatment, while *B. gigantea* and 'Darwin' have large seeds which must be burnt. My seeds of 'Robust' were of intermediate size but also responded well to fire. My plants are largely indistinguishable from 'Darwin,' but other growers tell me their plants look more like 'Kununurra.' So I am not too sure of what is happening here—I think somewhere some seed has gotten mixed up. Capsules of my 'Robust' open with water the same as 'Darwin.'

Are the forms 'Kununurra' and 'Darwin' taxonomically significant, or are their morphological differences minor or even induced environmentally? Certainly it is not environmental, because all my plants are growing in the same conditions, in partial shade in trays (I know my descriptions of the plants sound like I'm growing 'Darwin' in full sun and 'Kununurra' in a dimly lit closet!). I have experimented with hybridization to see if I could make crosses between these forms. Since 'Kununurra' does not produce seed if selfed, it makes an ideal maternal parent since it eliminates the danger of accidental selfing. I pollinated 'Kununurra' flowers with pollen from 'Darwin' and waited. Within a few days I could tell the crosses were not being successful, because 'Kununurra' flowers which are successfully pollinated usually lose their petals within two days. Repeated attempts at making this cross have produced no seed. Since the flower parts are so large I am sure I am successfully making the cross, especially since my crosses between different clones of 'Kununurra' invariably produces seed. I think I am encountering a genetic barrier—in other words, 'Kununurra' and 'Darwin' are certainly different species and should be formally described. All these plants are interesting and easy to grow. I keep mine sitting in water and away from frost and they flower and set seed well.

Special Book Review

Cheers, Gordon. 1992. **A guide to the carnivorous plants of the world.** Angus & Robertson, Pymble, NSW 2073, Australia. 174 p.+ix

Reviewed by Don Schnell

At the outset, my conclusion—This is an excellent book. It stands on its own quality, but additionally in light of the poor quality of other recent efforts in presenting a global summary of carnivorous plants, I would recommend that if you could only afford one book, this should be your first choice.

This is really a second, considerably expanded edition of the author's 1983 book. There are 231 mostly excellent crisply printed and well-selected color photos inside, and the dust jacket (followers of my book reviews know my attachment to dust jackets vs imprinted hard covers) also has color photos. There are abundant range maps and scattered line drawings where indicated. After the preface and acknowledgements, the author has a mapped climate key and a helpful pronunciation guide for beginners. The introduction, history and folklore and evolutionary paths sections are good reading and well illustrated.

I was pleased to see those old Scientific American fanciful illustrations from early in the century again—They are not often seen. And it was nice seeing actual pages of the legendary Veitch catalogs reproduced. The evolutionary chart provides food for thought, although one might question the leaps back and forth from monocot to dicot so easily, and latest plastid DNA studies indicate at least seven separate origins of carnivory in plants.

The next set of chapters on morphology, classification and trapping mechanisms are nicely done with actual photos of trap types in a chart instead of the usual line drawings. Cultivation and propagation will be of great interest to all readers and these two chapters are rather uniquely presented via examples or "type plants" for each of several recommended classes or modes of cultivation and propping. Specific details for each genus or species is given in later sections on those plants. There then follow the several chapters, one per genus, illustrating the CP of the world through selected species examples. Each chapter has an introductory page to the genus including a line drawing of an example and a range map of the genus, then the following pages example species with color photos and a well-conceived outline method of describing the species, habitat, native land, etc. Australia is rather heavily represented in the Droseras chapter, but they do have the most species and space is always limited in books. There is a rather unique chapter called "Field Trips" with color photos in which the author briefly describes field trips through several example areas of the world. There follows a so-so glossary, a monthly calendar of what to do with each genus each month of the year (with allowance for northern vs. southern hemisphere) in chart form, and a chart of cultivation guidelines. The world list is presented clearly and mostly accurately, and the usually dull nature of such lists is broken by occasional additional color photos sprinkled throughout. There is a list of organizations, and a bibliography and separate list of recommended reading which is reasonably representative.

There are very few typos and geographic errors or misplaced mountains. The *Catopsis* range map erroneously does not include southern Florida in the USA where plants are abundant. *Heliamphora* species are of course also found in swampy areas below the tepui as well as upon them. The author misses a few tricks such as informing the neophyte straight away on how to tell flowers of *Genlisea* spp. readily from similar utricularias without digging the plant up—Genliseas have five sepals.

But these errors in such a complex work are few and almost of the inevitable variety given the overwhelming positive nature of the book, and certainly errors of a 180° lesser degree than the disaster of another book of similar attempted scope by another author that I had the discomfort of recently reviewing.

The book is $45.00 Australian, and I do not know about outlets elsewhere such as in Europe and North America—Perhaps we will find out after the book has been out awhile. [Ed note: See Book List for updated information]. It is sturdily bound and the production is excellent on semi-glaze paper of good quality. While I have praised it as a best bet for one book for the beginner, we old timers can also get a lot out of it and I thoroughly enjoyed reading it.

Book Review

Temple, Paul. 1988. **Carnivorous Plants.** (A Wisley handbook). Royal Horticultural Society, London. 64 p. $5.95US.

Even though this booklet has been out for two years, it may not have come to your attention yet. In case readers are wondering what a "Wisley handbook" is, it is a series of booklets published on a wide variety of plant subjects by the Royal Horticultural Society in Great Britain. They have their gardens at Wisley, hence the name of the series.

This particular book is soft cover but quite sturdy. All photo illustrations (including cover and frontispiece) are in color and there are 40 of them and these are of excellent quality from original sharpness, color and composition to final printing. The photos cover a wide range of plants with multiple representatives of all major kinds of CP.

The several pages of introduction describe the nature of carnivory and list examples of CP. There follows 18 pages of instruction and comment on growing and propagation techniques, along with problems. The British have a great deal of difficulty with fungus diseases that we in the United States are mostly spared. The growing section includes methods of making outdoor bogs and beds, and lists of plants that can survive outdoors at various temperature limits. The author, therefore, makes a case for minimum cost for the beginning grower in particular in the use of windowsill and outdoor plantings.

There is then 28 pages of descriptions of various genera and/or species, along with more specific horticultural hints that are "fine tuning" over the general section.

The book is remarkably free of errors in spelling and nomenclature, except for misspelling *Utricularia sandersonii* (only one 'i' in the book, and a very fine photo labeled *Utricularia intermedia* is clearly *U. ochroleuca* instead. The photo shows vegetative material, but the foliar structure and presence of scattered traps along the foliar branch clearly indicates the correct identification.

The book is sufficiently inexpensive that I can recommend it to all CP enthusiasts. The experienced grower may have doubts about a 64 page book, but the photos and commentary on growing plants in Britain is worth it. Beginning or intermediate growers will find good solid information in addition to the above qualities. The list of sources is of course British and will probably become outdated, but that is no problem for CPN subscribers.

The book is available in Great Britain from various bookstores and of course from RHS outlets. In the USA, it may be purchased from Sterling Publishing Co., 387 Park Ave. S., New York 10016- 8810. I have also seen it for sale in the gift shops of several botanical gardens with other publications in the Wisley series.

Literature Review

Bender, Steve. 1990. "Beauty in the bog." Southern Living Magazine 25:42-44.

This popular article in a southern magazine describes how some people discovered a savanna bog on their property near Fairhope, Alabama. They had moved there with the intent to raise cattle. After clearing and burning off a wooded area one autumn with the intent of extending their pasture, the following spring they observed a heavy growth of beautiful bog plants, including *Sarracenia leucophylla.* They decided to preserve the area and have been burning it off every year since. They have now built a boardwalk for visitors to observe the very fine mix of plants. Three color photos show a very nice display over several acres. To visit the site if you are in southern Baldwin County, Alabama between April and September, call 205/947-3044 for an appointment and directions. There is a nominal admission charge of $2.00 to help cover expenses.

Earley, Lawrence S. 1991. "Stew in Brunswick." Wildlife in North. 55:14-21.

This article discusses the downturn in plant and animal species in Brunswick County, North Carolina as development and population growth take an upturn. For those not familiar with this county, it is the location of the legendary Green Swamp and has been called the most ecologically diverse county in North Carolina, and having the most threatened or endangered species. In the last ten years, the population of this previously rural county has doubled, as it did the ten years before that, and as it is expected to at least do in the next ten years. The main problem is exponential growth of retirement homes and golf courses and services to serve the increasing population. There are no zoning laws to protect wild areas, although enactment of these is being contemplated. Several biologists are quoted regarding decreasing plant and animal wild areas, and most of us who have been visiting the area for 25-30 years would readily concur. The article is considered and well written. There are many color photos among which are the following CP: A very nice full cover of *Sarracenia minor*, a savanna in moderate shape showing *S. flava*, and a photo containing both *Drosera filiformis* and *Utricularia cornuta*. There is also a semi-diagrammatic map of the county showing sample ecosystem locations. (DES)

Fagerberg, WR and D. Allain. 1991. A quantitative study of tissue dynamics during closure in the traps of Venus's Flytrap *Dionaea muscipula* Ellis. Am. J. Bot. 78:647-657.

This is a very good paper discussing research work done by the authors in extending what work had already been done on leaf movement in *Dionaea*. The paper opens with a brief but complete review of work done since Darwin to this day. They summarize closure into three phases, the first and third having been recognized before, but the second a new distinct category: Capture—The familiar quick phase, which has been studied most; Appression—An approximately 30 minute phase that is slower and results in trap margin contact; and Sealing—Completed in about 1 hour post-stimulation and characterized by tighter sealing of the trap margins just internal to the edges with the actual edges somewhat everted.

The authors very cleverly divide the trap into three zones (A,B and C) and excise these from several plants during the above mentioned phases. Excision was quick and smooth and fixation immediate so as to arrest any anatomic changes for study by light and electron microscopy. The article should be read for details and completeness, but in summary they found a very complex inter-related sequence of cellular enlargement changes in each of the three regions that collated with what would be expected physically to result in the gross observable three closure phases.

The authors conclude with some paragraphs of theoretical discussion on physiological control of this process which may be related to pH and calcium transport across cell membranes as extrapolated from Japanese research on these ions and their effects

on *Aldrovanda*, and the fact that traps can be successfully anesthetized by pH buffer variations and use of calcium channel blocker compounds. (DES)

Folkerts, G. W. 1990. The white-topped pitcher plant— A case of precarious abundance. Oryx 24:201-207.

This is a well written and conceived popular conservation article with four photos (including one ironic one of buckets of clipped *S. leucophylla* pitchers awaiting packing) and some references.

After a brief introduction on the nature of pitcher plants and their habitats, the article focuses on the Gulf coast where, at the moment, there is still a greater abundance of pitcher plant habitat compared to disastrously rapid destruction of sites on the Atlantic coastal plain. Here, the author also sees the beginning of a precipitous decline.

He describes the main roles of decreasing fire at appropriate times of the year (most natural fires are spring and summer and some research indicates better response than with the traditionally accepted winter fires), land use changes with drainage and destruction of habitat, horticultural collecting (personal and commercial) of taxa or variants whose numbers have become critical, and lately the growing fad of using *S. leucophylla* pitchers in flower arrangements here and abroad. Because CITES has regulated international trade in *Sarracenia* and their parts, we have a number of 500,000 pitchers of *leucophylla* per year in international trade, and an unknown number in unregulated interstate trade. The author discusses the harm of uninformed harvesting of massive numbers of pitchers from a stand at anytime, and effects on longterm plant health and productivity. (DES)

Karlsson, P. S., K. O. Nordell, B. A. Carlsson and B. M. Svensson. 1991. The effect of soil nutrient status on prey utilization in four carnivorous plants. Oecologia (Heidelb) 86(1):1-7

The authors tested the hypothesis that carnivorous plants are less responsive to prey when grown in nutrient-rich soil. Four plant species, *Drosera rotundifolia, Pinguicula alpina, P. villosa* and *P. vulgaris* were tested and seven characteristics were measured. The results were that 75% of the tests showed no significant difference and therefore the hypothesis was not supported by the data. An alternate modification of this idea is that CP can grow in nutrient poor or rich soils provided that competition from other plants is low.

Krafft, C. C. and S.N. Handel. 1991. The role of carnivory in the growth and reproduction of *Drosera filiformis* and *D. rotundifolia*. Bull. Torrey Bot. Club 118:12-19.

The authors collected plants of the above two species, potted them up in nutrient poor media under screening outdoors, and fed varying numbers of fruit flies to half the plants the other half being unfed and acting as controls. Growing the plants over a season disclosed that the fed plants in general had enhanced growth during the feeding period. The "feeds" carried over winter hibernaculum stage with increased flowering and seed production the following spring in those plants that were fed. They conclude that feeding in a nutrient poor environment has immediate as well as long lasting benefits. The discussion was interesting in trying to collate results of conflicting experiments in other papers in the bibliography, particularly with field experiments. One interesting experiment suggested that in the case of sundews growing in moderately rich fields with other competing plants, carnivory gave a competitive edge to the sundews as a source of nutrients other than the soil. (DES)

MacRoberts, B. R. and M. H. MacRoberts. 1990. Vascular flora of two west Louisiana pitcher plant bogs. Phytologia 68:271-275.

The authors reference their previous paper on two similar bogs and mention that little has really been done in studying the pitcher plant bogs west of the Mississippi River. They describe the two present bogs located 0.5 km apart in Kisatchee National Forest. They are seep slope bogs with mucky soil and little sphagnum except for incidental patches. Soil analyses are provided with the expected results. All important flora is listed, including the CP: *Sarracenia alata, Drosera brevifolia, D. capillaris, Pinguicula pumila, Utricularia cornuta, U. juncea* and *U. subulata.* (DES)

Sattler, R. and R. Rutishauser. 1990. Structural and dynamic descriptions of the development of *Utricularia foliosa* and *U. australis*. Can. J. Bot.68:1989-2003.

In traditional taxonomy, morphologic structures are usually described in static terms for purposes of classification and identification. One might say, "A leaf is a leaf is a leaf... ". However, the utricularias offer good models supporting a case for a dynamic approach, at least theoretically, since there is much discussion over what constitutes leaves, stems, roots (if any), shoots, etc., and what the traps are in traditional terms. The authors document development of shoots by means of SEM and make a proposal of how such studies and dynamic intermediate stages may in the future be useful in taxonomy. (DES)

Sieren, D. J., et. al. 1990. Noteworthy additions to the vascular flora of eastern North Carolina. J. Elisha Mit. Sci. Soc. 106:7-9.

The only CP mentioned is a new county record for *Drosera brevifolia* in New Hanover County which is one of the counties immediately adjacent to Wilmington. (DES)

Sorrie, Bruce A. 1992. *Utricularia inflata* Walter (Lentibulariaceae) in Massachusetts. Rhodora 94:391-392.

U. inflata is reported for the first time from New England in an artificial impoundment lying between Carver and Plymouth in Plymouth County, MA. This brings the number of Utricularias in the state to 13. Federal Pond is a reservoir for a cranberry growing operation. After considering several possible mechanisms of introduction, the most likely is via waterfowl. (DES)

Speta, F, and F. Fuchs. 1992. *Pinguicula debbertiana* (Lentibulariaceae), eine weitere neue Art aus Mexiko. Linzer Biol. Beitr. 24:375-380. IN GERMAN.

From the now famous area of San Luis Potosí (famous among Mexican *Pinguicula* fans), this new species is described. It appears to be most closely related to *P. esseriana.* The paper contains two pages of line drawings of key morphologic features including the flower in several views.

Valdés, Cristina P. 1989. Estudios preliminares en el género L.(*Droseraceae* Salisb.) en Cuba. Revista del Jardín Botánico Nacional 10:207-212. IN SPANISH

Herbarium specimens of the genus *Drosera* L. were reviewed from Cuban herbaria. Dot location maps are included in the paper and show what the author concludes are three species of the genus in the country: *D. intermedia, D. capillaris* and *D. brevifolia.* In the past, some of the specimens had been identified as *D. rotundifolia* and *D. tenella* which could have given a total of five species instead of three. However, with the possible exception of one problematic specimen in poor condition and labeled by her as *D. capillaris,* it would appear there are only three species collected so far. The author introduces the paper with a short summary of the family and its carnivorous features. (DES)

Venters, Vic. 1991. Stiffer penalties may deter poaching: Law strengthened to protect rare Venus's flytraps. Wildlife in North Carolina 55:28(Aug).

This is a full page informational article with a black and white photo of *Dionaea.* In spring, 1991, stiffer penalties went into effect for poaching this species. By poaching, the law determines that the term applies if the plants are collected from state lands (including roadsides and ditches to the extent claimed by the state), parks, federal lands, wildlife and nature preserves, and private lands without written permission of the owner. Owners may collect and sell from their own lands at will. Formerly, the penalty for poaching was a paltry $10.00 per arrest—Hardly a deterrent! The new penalty is a minimum of $100 and a maximum of $500 for first offenders. Repeaters may be fined $1000. This could still be little deterrent for the professional poacher collecting by the truckload, if it were not that the thief can actually be fined these amounts per plant!

It is estimated that over 500,000 *Dionaea* are removed from the wild each year. Most of these are sold to Holland, Germany and Japan. Besides plant removal, habitat destruction is also stressed as a very important factor in decreasing the genus in the wild.

(Editorial comment: The article mentions that this spring, someone was apprehended in the Green Swamp sanctuary with 1000 plants in possession, so the process can work. The article also states that clearly disclosed that these were collected and potted up. Recall the entrepreneur written about in the Greensboro, NC newspaper a year or so ago who bragged about dumptruck-loads of CP collected and legally shipped from Wilmington ports to Holland. I clearly recall about two years ago being awakened by a phone call at 4 AM and a gruff foreign voice over long distance demanding—not asking about—250,000 flytraps "right away", and did I know anyone who could do it! The caller identified his location as the Netherlands.) (DES)

MULTI VITRO CARNIVOROUS PLANTS

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The 1993 List Of CP Books

Not available through CPN. Order directly from publisher, your local bookshop or C.P. Nursery. **Bold** books are new to the list for 1993.

• = Books intended primarily for children. O = Books out-of-print.

1. A Guide to the Carnivorous Plants of the World. 1992. Gordon Cheers. Angus & Robertson, Pymble, NSW, Australia. Andrew Isles Bookshop, P.O. Box 358, Prahran 3181, Australia $45.00+$6.00P&H. Use VISA/ MC/AE card number to simplify money exchange. USA: Call 800/242-7737 to order (800/CHARPER)

•2. Animals & Plants that Trap by Phillip Goldstein. Holiday, 1974; Holiday House, Inc.: 18 E. 53rd St.; New York, NY 10022. $5.95.

3. Carnivorous Plants by Gordon Cheers. Globe Press. Melbourne. (ISBN 0-9591937-0-7) $9.95

4. Carnivorous Plants by Francis E. Lloyd. Peter Smith; 6 Lexington Ave., Magnolia, MA 01930; USA. 1942 ed. Paper $7.95. (ISBN 0-486-23321-9)

5. Carnivorous Plants by Randall Schwartz. Avon Books, 1975; 959 Eighth Ave.; New York, NY 10019; USA. Soft cover $1.25 (ISBN 0-275-51580-X)

6. Carnivorous Plants by Adrian Slack. MIT Press, 1979; 28 CarletonSt.; Cambridge, MA 02142; USA. 1984 paper $13.95. (ISBN 0-262-69089-6)

•7. Carnivorous Plants by John F. Waters. Franklin Watt, Inc.,1974; 845 Third Ave.; New York, NY 10022; USA. $4.90.

•8. Carnivorous Plants by Cynthia Overbeck. Lerner Publications, 1982; 241 First Ave.; Minneapolis, MN 55401; USA. Paperback $5.95. (ISBN 0-82259535-4)

9. Carnivorous Plants by Paul Temple. 1988. A Wisley Handbook. Royal Horticultural Society, London. Available in US for $5.95 from Sterling Publishing Co., 387 Park Ave. S.; New York NY 10016-8810. (ISBN 0-30430045-6)

10. Carnivorous Plants-Care and Cultivation. 1990. Marcel Lecoufle. Blandford (Villiers House, 41/47 Strand, London WC2N 5JE). US Dist., Sterling Publishing Co. Inc., 387 Park Ave. South, New York, NY 10016-8810. English version. (ISBN 0-7137-2185-5). $29.00.

11. Carnivorous Plants of Australia. Vol. I & II by Allen Lowrie. West Australia Univ. Press, 1986; Nedlands, WA 60009; AUSTRALIA. Or: International Specialized Books; 5602 NE Hassalo St.; Portland, OR 97213; USA.800/5477734. Paperback $27.50; hardback $45.00. Plus $2.25 UPS. (ISBN 0-85564254-8)

12. Carnivorous Plants of California by J.HawkeyeRondeau,PhD. 1991. $15.95+postage from author (37Sunnyslope Avenue, San Jose CA95127; USA. Tel. 408/929-6529.)

13. Carnivorous Plants of the World by J. & P. Pietropaolo. Timber,1986. Peter Pauls Nurseries; Canandaigua, NY 14424; USA. $30.30. (ISBN 0-88192-066-5)

14. Common Marsh, Underwater & Floating Leaved Plants of the United States & Canada by Neil Hotchkiss. 1972.

15. CP of the US & Canada by D. E. Schnell. John F. Blair, Publisher,1976. 1406 Plaza Dr., SW; Winston-Salem, NC 27103. 1976 ed. $9.50 + shipping. (ISBN 0-910244-90-1)

16. Cultivating Carnivorous Plants by Allen Swenson. Doubleday & Co., 1977;

•17. Insect-Eating Plants by L.&G. Poole,T.Y. Crowell, 1963; 666 Fifth Ave.; New York, NY 10016; USA. $4.50

18. Insect-Eating Plants and How to Grow Them by Adrian Slack. 1986. (ISBN 0-295-96637-8). Marston Exotics; Brampton Lane, Madley, Hereford; ENGLAND UK HR2 9LX. £13.50 ($22.55 aprox.) includes postage & handling (P&H)

19. Insectivorous Plants by Charles Darwin. AMS Press, 1893; 56 E. 13th St.; New York, NY 10003; USA; Vol. 12, 1972. $42.50. (ISBN 0-404-08412-5)

•20. Killer Plants. 1993. Mycol Doyle. Lowell House Juvenile, Los Angeles, CA 90067. (ISBN 1-56565-056-5) 30p.

21. *Nepenthes* of Mt. Kinabalu (in English) by S. Kurata. Sabah National Park. Marston Exotics (see #15 for address). £7.50 ($12.53 approx.) includes P&H.

•22. Pitcher Plants by Carol Lerner. William Morrow & Co.; New York. $12.95. (ISBN 0-688-01717-7)

23. Pitcher Plants of Peninsular Malaysia & Singapore by Roger G. Shivas. $10.50. (ISBN 9-971-954-16-8)

24. Plants of Prey in Australia by Rica Erickson. Univ. of W. A. Press, 1986. Marston Exotics (see#15 for address).£16.75 ($27.97 approx.) includes P&H.

•25. Plants That Eat Animals by J. H. Prince. Lodestar Bks.; 2 Park Ave.; New York, NY 10016; USA; 1979 ed. $8.95.

26. The Carnivorous Plants by B. E. Juniper, R. J. Robins and D. M. Joel. Academic Press, Book Market Dept., 1250 Sixth Ave., San Diego, CA 92101. Tel. 1-314-528-8110. $161.00. (ISBN 0-12-392170-8)

27. The Genus *Utricularia,* a taxonomic monograph, KEW Bulletin, Series XIV, Royal Botanical Gardens. $68.00. (ISBN 0-11-250046-3) HMSO Publication Center, P.O. Box 276, London SW8 5DT, ENGLAND.

The 1993 CP Sources

Note: All individuals or organizations selling, trading, or buying CP are advised to be cognizant of certain restrictions under the U.S. ESA and international CITIES for certain species (see editorial, CPN 12(1):3, 1983). ***Bold*** *sources are new for 1993. Welcome!*

Name and Address	**Catalog Price**	**Stock**
Alain Christophe 37, Avenue Turgot Oxoir-la-Ferriere F-77330 France	$7s	S. African *Drosera* seed
California Carnivores 7020 Trenton-Healdsburg Road Forestville, CA 95436	free	*Dionaea, Drosera, Sarracenia, Utricularia, Pinguicula, Nepenthes*, books, soil mixes

Name and Address	Catalog Price	Stock
Carolina Exotic Gardens Rt. 5, Box 283-A Greenville, NC 27834 USA	$1.00	*Darlingtonia, Dionaea, Drosera, Pinguicula, Sarracenia,* live *Sphagnum* moss
Charles Powell 2932 Sunburst Dr. San Jose CA 95111 USA	Inquire	
Cyril G. Brown 65 Highfield Cres. Hornchurch Exex. RM12 6PC ENGLAND	Inquire	
D. Crump's Carnivorous Plants 4174 Welling Ave. Charlotte, NC 28208 USA	Free with S.A.S.E.	*Dionaea, Sarracenia, Drosera* Live sphagnum moss
Glasshouse Works Church Street, Box 97 Stewart, OH 45778 USA	Free	*Nepenthes*
Heldon Nurseries Ashbourne Road Spath Uttoxeter ST145AD ENGLAND	Inquire	
Hinode-Kadan Nursery 2735 Nakanogo, Hacijyot Hachihyo-Island Tokyo 100-16 Japan	International Reply Coupon	*Byblis, Cephalotus, Drosers, Pinguicula, Nepenthes, Utricularia*
Hungry Plants 1216 Cooper Drive Raleigh, NC 27607 USA	$1.00	Tissue cultured plants
Lee's Botanical Gardens P.O. Box 669 La Belle, FL 33935 USA (813/675-8728)	Free	B-S-T all varieties of CP
Marie's Orchids & CP 6400 Cedarbrook Drive Pinellas Park, FL 34666 USA 813/546-7882	$1.00	*Heliamphora, Dionaea, Nepenthes, Cephalotus, Drosera, Pinguicula,* CP growing supplies, Tissue Culture Services
Milingimbi Nursery 69 Pringle Avenue Belrose NSW 2085 AUSTRALIA	Free	*Byblis, Cephalotus, Drosera, Dionaea, Nepenthes, Pinguicula, Sarracenia, Utricularia*

Name and Address	Catalog Price	Stock
Nature et Paysages J. J. Labat, Empouchon Peyrusse-Massas F-32360 Jegun FRANCE	Inquire	All CP Families
Orgel's Orchids Box K-6, 18950 SW 136th St. Miami, FL 33187 USA 305/233-7168	Free	*Byblis, Dionaea, Drosera, Nepenthes, Pinguicula, Utricularia*
Peter Pauls Nurseries Canandaigua, NY 14424 USA 716/394-7397	Free	*Darlingtonia, Dionaea, Nepenthes,* seed, *Pinguicula, Sarracenia, Utricularia,* live *Sphagnum*
Renate Parsley 1, Woodlands Road Somerset West, 7130 REPUBLIC OF SOUTH AFRICA	Inquire	Native CP seed
Roy Young 1 International 79, Pearcroft Road Leyton Stone London E11 44P ENGLAND 01/556-8048	Reply Coupon	Seed of CP
Sarracenia Nurseries Links Side Courtland Avenue, Mill Hill London NW7 3BG ENGLAND	Inquire	
Southwest Carnivores 300 W. Carter Dr. Glendora CA 91740-5915 (T&A), USA	Free with SASE or 2 reply coupons	Pygmy Droseras *Dionaea, Sarracenia, Utricularia* *Pinguicula*, Sphagnum moss
South West Seeds Dough & Vivi Rowland 200 Springs Road Kempston, Bedford MK428ND ENGLAND		
Thysanotus-Seed-Mailorder Postfach 44-8109 Bremen 44 D-2800 WEST GERMANY	Inquire	*Byblis, Darlingtonia, Drosera, Drosophyllum, Nepenthes, Pinguicula, Sarracenia, Utricularia*

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All material you wish to have considered for publication in CPN must be sent to either Don Schnell or Joe Mazrimas (addresses on inside front cover), not to the business address at the Fullerton Arboretum. Text material similar in character to that in the NEWS & VIEWS and SHORT NOTES will be considered. Please keep written material as succinct as you can.

All written material, no matter how brief MUST be sent typewritten or word-processed in double space format to allow the editors room for editing marks. For purposes of computer scan page setup, a laser or laserjet printout is best, followed by a new or recently installed ribbon in a standard printer or typewriter. Copy must be crisp and clear. Copy submitted in any other format will be returned for appropriate processing. Computer users are encouraged to submit a 3.5 inch disk, preferably Macintosh compatible, along with a printout.

Color photos to accompany your article may be submitted as either 35mm slides or quality prints. Slides or prints that are blurred or have poor distinction between the subject and background, cannot be used. Keeping in mind the expense of producing color illustrations, and to allow others the same privilege, keep your numbers of photos to the minimum required to best illustrate your point in using them. All photos must be accompanied by an appropriate legend. Do not write the legend on the back of prints or on an envelope containing the slides. All legends must be typed or word-processed on a separate page as described for text. Number the photos in light pencil (for prints lightly on the backs) and use a corresponding number on your page of legends.

We do not encourage submission of any illustrative material that does not accompany an article. We usually have sufficient material backed up for "filler pictures" and will put out a call if more are needed.

In submitting photos, it is best to send duplicate prints or slides in case of loss or damage. We will make every effort to promptly return photos if requested, otherwise we will assume they are duplicates.

After submitting material, please be patient regarding replies. Some material may require review by both DES and JAM, or even an outside reviewer. If your material is accepted, and it is not timed as a dated announcement, please be patient awaiting its appearance in CPN since we sometimes have material for a whole year's issues.

"30" Leo